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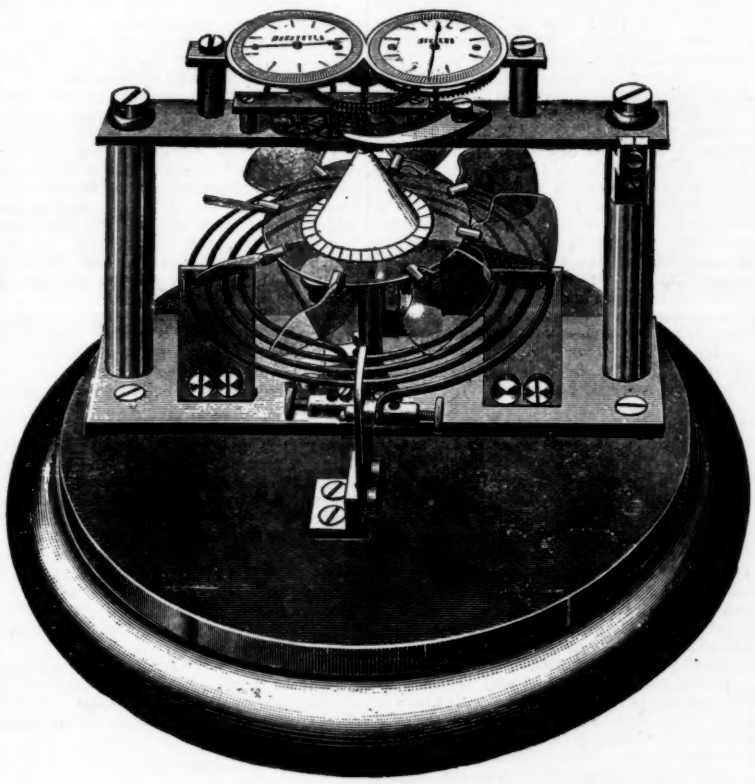
An Electric Current Meter.

By Professor G. Forbes.

At the present moment the mind of electrical engineers is much directed to the successful means of distributing electricity to a large district from central stations by means of that class of induction apparatus which has received the several names of "secondary generator," "transformer," and "converter." This is the only thoroughly worked out system available to the engineer for an extensive supply of electricity. Currents of an alternating character (*i.e.*, alternately positive and negative in direction, the alternations being at the rate of some hundreds per second of time), and of high tension or pressure, are by this system carried from the engine house, by comparatively thin and cheap wire conductors, to the points of supply. The only difficulty which has been met is in the designing of a suitable meter. There is absolutely no meter available that pretends to be reliable. The very best indicates a totally different result when the same current is passed through it, if the number of alternations of the current (*i.e.*, the speed of the dynamo) be altered. It was to overcome this source of trouble and to remove the last difficulty from an otherwise perfect system of electric distribution that the author undertook the labor of designing and perfecting the meter here described. Some idea of the work expended in bringing it to its present state of perfection will be gained when it is stated that the trial observations during the development of the instrument number nearly 10,000. Seeing that the only electrical actions available were those of chemical action, electro-magnetic action, and heat, that the chemical method is incapable of being used with alternate currents, and that all electro-magnetic meters must vary in their indications with the rapidity of the alternations, the author was led to base his instrument on the heat developed by an electric current. Such an instrument must be equally applicable to continuous currents and to alternate currents, whatever their rate of alternations. Thus a meter is obtained which is practically perfect and more simple in construction than any of those designed for a more limited range of uses. The instrument is extremely simple both in principle and in construction. It consists essentially of a flat spiral of iron wire with two terminals. Sometimes these two terminals are united to form one, the other being attached to the middle of the wire. Thus the instrument exhibited may be used as an accurate measure for currents from half an ampere or from one ampere upwards. Above the conductor a set of vanes is pivoted. This consists of a circular disk of mica with a hole in the center, in which is fixed a pinion with a concentric ruby cup. Round the circumference of the mica disk eight small cylinders of pith are fixed at equal distances, and eight vanes inclined at 45° to the mica disk are attached to the pith cylinders, these vanes being made of the thinnest mica. This set of vanes is supported with the ruby cup resting on a steel point fixed to the base of the instrument. The pinion engages with the first wheel of a train of clock work actuating the indices, which show upon two dials the number of revolutions made by the vanes. The action of the instrument is very simple. The electric current passing through the iron conductor creates heat, which sets up a convection current in the air, and this causes the vanes to rotate about the vertical axis and drive the clock work. The number of revolutions indicated on the dials is, through a considerable range of currents, an exact indication of the number of coulombs or ampere-hours which have passed through the conductor. The friction of the ruby cup on he pivot determines the smallest current



Prof. Forbes' Electric Meter.

which can be accurately measured, and the friction of the clock work is imperceptible. The following table shows the performance of one of these vanes. The conductor used had a resistance of 0.1 ohm; the first line shows the rate at which the current was flowing through the conductor; the second line gives the ratio of current to speed of rotation, a ratio which ought to be constant:

Current in amperes.	.25	.35	.45	.6	.75	1	2	3	6	12
Ratio of current to speed	76	61.25	50.4	51	50.75	51	51	50.7	51	51.6

When using higher currents the ratio is equally constant.

Sir William Thomson complimented the author on having practically solved a problem on which he himself had been working for a long time, but not with the same satisfactory results. He was nevertheless extremely pleased at the success achieved by Professor Forbes, because with the invention of a good and reliable meter one of the obstacles to central station lighting had been overcome. The difficulties of making a meter to correctly record alternating currents were very great, one of them being due to the action of the current upon itself. Even in continuous current instruments a slight variation in the strength of the current will sometimes cause an error due to self induction. Thus, in one of his current balances, the slight variations in the speed of the engine introduced an element of error. Professor Forbes had, however, succeeded in devising a type of instrument in which the self induction can be made as small as desired, and thus a degree of accuracy to within two or three per cent. might be obtained, which is quite sufficient for practical purposes.

After several questions from other speakers, Professor Forbes replied that he found absolutely no difference in the working of the meter, whether it was traversed by an alternating or a continuous current. In fact, an alternating current seemed to introduce less apparent resistance than a misdirected current rapidly made and broken. The size of the glass cover he found to be of importance, the larger cover allowing the mill wheel to start with a smaller initial current. An instrument intended for a maximum supply of twenty lamps would start with half the current strength required for one lamp, and would register correctly from one lamp to twenty. The wheel work does not introduce any appreciable friction.

Multiplex Telephony.

Dr. Tommasi's method is based upon the phenomenon of the persistence of the sensation of sound. That an effect of this character does exist is evident from the fact that we hear musical tones of above sixteen double vibrations per minute as a continuous sound, and not as a succession of waves, such as really exist in the atmosphere. Dr. Tommasi, therefore, proposes to make use of the principle employed in multiplex telegraphy, and to cause rotating cylinders to make successive contacts between the several lines which are to be joined, each contact recurring in less than one thirty-second of a second. The cylinder must therefore rotate at a rate of not less than 2,000 revolutions per minute. It is further necessary that at the opposite end of the single-line wire a similar cylinder shall be maintained in absolutely synchronous rotation, so that the two cylinders shall always connect the same lines at the same moment. Dr. Tommasi suggests that the first cylinder should be driven by a small electro-motor, and that the synchronism of the second should be maintained "by one of the well-known methods." It is doubtful whether there is any known method by which this can be done other than by Delany's adaptation of La Cour's "phonic wheel." In this case it will be necessary to run a separate circuit for the performance of this regulation, which will itself give rise to such a noise that one can hardly expect that conversation can be conducted with any degree of comfort. The subject is one of sufficient importance to attract the attention of the electrical inventor, for telephone circuits are multiplying rapidly nowadays, and like the telegraphs, any system of duplexing or, better, multiplexing, will be a great advantage. The subject is one, however, for experiment, as practically there are few data to guide one to a definite opinion on the feasibility of the scheme.

Practical Bearing of the Cowles Electric Smelting Process.

The United States Naval Institute will soon issue advance copies of a paper by Alfred H. Cowles on aluminum bronze for heavy guns, which will be discussed at a meeting of the institute to be held in Annapolis on Oct. 27. Mr. Cowles argues that by either the Rodman or Deane process of casting, guns can be made of this alloy that will have a much higher tensile strength and ductility than the finest quality of mild steel forgings; that it would be impossible to burst a gun cast from this alloy with four times the powder pressure now used in the "built up" steel gun, and, finally, that the plants required for producing aluminum bronze and casting guns therefrom would not require more than one-third as great an outlay as it is proposed to invest in plants for the construction of built up guns, while not one-quarter of the time will be necessary to build the aluminum plant and guns. Mr. Cowles also estimates that guns can be cast from aluminum bronze at 20 per cent. less cost than the forged guns of steel, while 60 per cent. of this cost will be capital stored away in the metal of the gun, which metal can be remelted and used over an indefinite number of times. The leading metallurgists and ordnance experts of the United States, Great Britain, France, Belgium, and Germany will be invited to discuss the paper.

Underground Work.

By W. D. Sargent, Before the Pittsburgh Telephone Convention.

In my remarks on underground work last year, the style of our creosoted wooden conduit was fully described.

In the latter part of December, 1886, in consequence of the passage of an amendment to an existing ordinance by the Board of Aldermen, the Commissioner of City Works refused to issue permits for opening the streets. For this reason our underground work has been at a standstill. We had submitted plans for 1887 for six miles of creosoted wooden conduit, which were approved by the Subway Commissioners; but, for various reasons, an application to the court for a mandamus has been delayed until now, and a decision is expected in the next few days. The Dorsett conduit, five miles in all, connecting Brooklyn and Williamsburgh, when completed proved to be very defective. The faults in it are due to several causes, but chiefly to carelessness in laying it in the ditch and making the joints. After a great deal of work, occupying all this year, the ducts are now reported ready for occupancy. The Dorsett material is very rough, and at the joints it squeezed through the cracks, making projections that were broken off in the process of clearing out, and brushes had to be run through to clear these pieces out Even now the ducts are so very rough that a lead cable is badly scratched in hauling in. It was claimed this material was gas-tight, water-tight, or even mud-tight; all of these things have been found in the ducts and manholes. The only explosion of gas we have had in Brooklyn was in a Dorsett manhole. Recently the elevated railroad people exposed about eight feet of the first creosoted wooden conduit we laid three years ago. There is not the slightest decay externally, and the ducts inside are clean and dry, the friction rollers running as smoothly as when first laid. Looking backwards, we feel that had we to do the work over again we should enlarge the ducts to 3x3 inches inside or double or treble their number, because we now see that, with increased diameter necessary in cables and the use of double conductors, our space will soon be exhausted.

We had expected to be able to lay six miles of conduit this year, which would make a total of twenty miles. This work was prevented by the conflict of authority between the Subway Commissioners and the Board of Aldermen. No change has been made in our plans for distributing, and we expect to do this from terminal poles and house-top fixtures. In the business portion of the town we are able to secure places for fixtures without much trouble, but amongst residences it is very difficult. We have carried the cables to house-top fixtures; in one case by going through the cellar to the rear of the building, then up the wall to the fixture on the roof. We have a cable box in the cellar, and run all wires in use for that from there. In two other cases we have run a galvanized iron pipe up the face of the building alongside the water spout, and through this carry the cables to the fixtures for distribution.

We are in communication with the elevated railroad people for the purpose of carrying cables and wires on their structure for distributing purposes. No terms have been made yet.

The Brooks cables, covered with pure lead, have now been in service three years. The corrosion of the lead pipe noted last year is still going on, with indications that it will take several years more to reach the insulated wires. The Western electric cables, lead with a small percentage of tin, placed in the same conduit at the same time, show only a thin, hard white scale, with no indications that it is increasing. The N. Y. & N. J. cables, covered with lead and tin, have been in the conduit about nine months and they show no corrosion beyond a thin scale. I think we may assume that a composition of lead and tin resists the action of the gases in the underground conduits. We now have 18 cables, aggregating 1,700 conductors, leading out underground from our Brooklyn Central office; 939 of these conductors are in actual service; six cables, aggregating 500 wires, leading out from the Bedford office; 175 of these conductors are in actual service.

We have, all told, 16 miles of cables underground; 1,500 miles of conductors; 900 miles of which are in actual service.

The cables leading out from the Brooklyn Central office range from 900 to to 7 180 feet; in Bedford from 460 feet to 2,250 feet.

The first cables furnished by the Western Electric Company, 100 wires mixed indiscriminately, have been in service since November, 1884, and have given satisfactory service, with one intermission on account of defective terminals. This difficulty seems to have been solved by their last devices for that purpose, and no serious decline in the insulation has occurred for the past two years.

The wire used in all our present cables is .035 to .038 inches diameter, with insulation .075 to .088 inches.

Realizing that metallic circuits will be necessary in underground work, all our cables were ordered twisted in pairs or groups of four. Through a misunderstanding, a portion of the cables were furnished indiscriminately.

We now have cables with the conductors related to each other in three different ways.

It was found at once that the cross talk between two of a pair, or two of four, was too great for satisfactory service. There is no cross talk between the pairs or the groups of four.

One cable of 7,160 feet, 100 wires twisted indiscriminately, of the Western Electric manufacture, has some cross talk, but not enough to prevent its use, and 84 of the 100 wires are in active service. The insulation of the cable varies from 650 to 450 megohms in summer, and the capacity is .227 microfarads per mile.

The next in length was made by the N. Y. & N. J. Telephone Company, 6,660 feet, with 100 wires twisted in pairs. The cross talk between pairs was so bad we were compelled at once to take measures to remedy it. The joints were opened and the pairs broken up at all the manholes at intervals of about 800 feet. The effect of this work was to reduce the cross talk between pairs and distribute it among all the wires It may be expected of course, that more frequent transpositions would make the cable just as good as the Western Electric. This is not practicable and we shall restore the wires to their original relations, grounding the twin wire until the metallic circuit era arrives. The insulation of this cable ranges from 54 to 29 megohms per mile, and the capacity is .3 microfarads per mile. Thirty subscribers are working through it.

The shorter cables give similar results, diminishing proportionately to the length.

To connect our Brooklyn Central with branches at Bedford and Williamsburgh will require 2½ to 3 miles of cable, and we believe, if we followed the Western Electric type there would be enough cross talk to make them valueless, or if we ground the twin wire in the N. Y. & N. J. type we believe there will be retardation enough to make serious trouble. We have therefore decided to make our long trunk lines of copper .050 in diameter and insulation .125 in diameter. This reduces the copper resistance nearly one half and increases the thickness of the insulation. Sixty wires of this size may be put in 1⅛ inch core, making a cable with an outside diameter of 1½ inches. We are restricted to this size by the two inch holes in the Dorsett conduit.

Owing to the delays caused by the action of the Board of Aldermen, none of this cable has been made up to show what its electrical qualities will be.

The insulation of the Western Electric cables quoted shows there has been no reduction since the last terminals were put in. The N. Y. and N. J. cables do show loss of insulation; but we attribute this to the joints and terminals, our men lacking skill and experience. Time will improve this, and, other things being equal, we believe both cables will give good results.

We believe it economical and desirable to have employes capable of doing all kinds of cable work, including joints and terminals, and have two men under instruction for that purpose.

A 25 wire okonite cable was drawn into the creosoted wooden ducts two years ago, and last summer it was removed to make room for more wires. There is no sign of deterioration or decay in the rubber, and the insulation is 150 megohms per mile in water since it was taken out of the conduit. It is generally believed that rubber cables will be damaged or destroyed by laying in creosoted wooden ducts, unless protected by lead. It would be interesting to make further trials to demonstrate whether this be so. For terminal wires leading from the conduit to the building some form of rubber or gutta percha wire is the most convenient.

We expect to remove our Brooklyn central office to a new building, as soon as we can get permits to open the streets. All our wires will be brought into this building underground. The new office will be equipped with the the latest improvements in multiple boards, including metallic circuits.

There is a great want of knowledge amongst users of cables as to the best forms, size and dimensions necessary, to be able to predict with reasonable accuracy what results may be expected from any given length of cable.

The results obtained by the American Telephone and Telegraph Company, in operating long distance communications by means of large copper metallic circuits and improved transmitters, has brought into prominence the necessity for a higher degree of efficiency in exchange work.

It would seem as though enough experience has been had, if formulated properly, to guide our efforts to higher efficiency. With this end in view, E. J. Hall, jr., of the American Telephone and Telegraph Company, recently invited a few telephone men living in the neighborhood of New York to meet at his office for the purpose of discussing the subject of telephone cables and making an effort to define the qualities that are needed for good work.

Dr. Jaques, electrician of the American Bell Telephone Company, read a very interesting paper on the results obtained on a very large number of lines varying in length, resistance and capacity, and from these results offers a formula for calculating the requirements for good commercial talking to any required distance.

His definition of a good line is very good, although I think many exchange lines would be disqualified by his standard.

It is that when two persons not experienced telephone experts are able to carry on a conversation without repeating, or at least no more than speaking face to face.

He believes that the readiness with which telephone conversation may be carried on depends on, first, the total electrical resistance of the circuit forming the two stations; second, on the total electro static capacity of this circuit.

That no matter what may be the distance between two points, good business conversation may be carried on between them, provided they be connected by a pole line or cable, or both, the product of whose total resistance by its total capacity is less than 2,000 for Blake transmitters and 4,500 for the Hunnings transmitters.

He claims that by this formula it is possible to write a specification for any line it may be desired to build.

This formula applied to several lines leading out of New York city seemed to prove its truth.

The specifications for a standard cable, meeting all the requirements of telephone work, are confined within narrow limits, on account of necessary multiplicity of wires and lack of space in all large cities.

Mr. J. P. Davis, consulting manager of the American Bell Telephone Company, states that .125 of an inch is all that can be allowed in New York city for one wire. After a full and free discussion of the electrical and mechanical difficulties of underground cable work, it was agreed that all cables whose wires occupy the space mentioned, namely, .125, should have not more than 350 pounds resistance, and .20, manufactured of these wires given .035 to .050 diameter insulated to .125—this gives about No. 8 B. and S. gauge—should be twisted in pairs and laid up in concentric layers, reversing the direction of each layer.

During the time these conductors are used in grounded circuits the twin wire would be kept grounded, operating as a shield against cross talk.

It was also agreed that the best way of wiring new multiple boards is to make them up for metallic circuits at once, placing one ground, as long as they remain, in the subscriber's office, and the other at the point where the twin wire ends.

Realizing the importance of the conclusions arrived at by the conference, the Metropolitan Company has decided to wire its new colossal board in this way, and the new switches for Buffalo and Brooklyn will be wired in the same way.

This will place the central office on a loop, which can be completed at any time metallic circuits are available and makes the transition from ground to metallic circuit gradual and easy.

Discussion.

Mr. Bailey having asked for information as to the process by which Mr. Sargent spliced his cables, the president called on Mr. Patterson to give a description of the method.

Mr. Patterson: The only thing to look out for in making a joint in a lead-covered cable is to keep out moisture. The ends of the cable, after the cable is made, should always be sorted out. Then after the cable is drawn into a conduit the end of the pipe is cut off and the pipe removed from the core for a distance back corresponding to the size of the cable. For 100 wire cable we would want to strip about 18 or 21 inches on each end. On the new style of cables arranged for metallic circuit, each pair of conductors are twisted together and served with a single splint of cotton. The serving around the two wires will hold them in place until the man who is doing the splicing deliberately removes it. One is covered with white cotton and one with red and white—some color that can be easily distinguished The two wires are brought together and the way we generally make a splice, and the best way, I think, is to strip the wires for an inch and a half, bring them together, and instead of making a long splice, bend them up and then twist the ends together. That will leave the wire running through and the two ends twisted together standing at right angles to it. A cotton sleeve is drawn over it. This sleeve is like the outer braiding of office wire. After all the wires are spliced in that way they should receive a bath in very hot paraffine poured on while they are laid out loosely to remove moisture which they may gather from the atmosphere and from the hands of the men. Then the core should be covered and brought down to a compact size, so that the lead sleeve will slip back over it. After that sleeve is on it should receive another paraffine bath. After the work is all done it is well to take a torch or something of the kind and pass it along underneath the cable and melt the insulation for a distance of one or two feet each side, so as to put on a pressure and test the joints, and if there is any flaw it will show itself by the paraffine oozing when the pressure is put on. Occasionally in underground work it is not convenient to make a sleeved pipe. In that case we turn both ends of the cable up and bring them out through the top, and have a brass casting in the form of an inverted Y. The two branches of the Y are of such size that the cable pipe will slip into them, and the main outlet is large enough to make the splice. The wires are brought up through there and spliced together, and the opening covered by a cap, either an ordinary pipe thread screwed in, or, if it is larger, by a flange and boylster on the outside. After the work is done that Y is dropped down into the hole and lifted. That removes the necessity of doing the work in the manhole, It is litted up to the level of the street, and the man sits on the edge with his feet inside and works on it.

Mr. Seeley: In New York city the Metropolitan Company have something like 18 miles of underground cable. It consists of three differents systems—the Edison, the Brooks, and the Western Electric. We have 9 miles of the Western Electric in Sixth avenue. The longest length is 2 miles. We have had one explosion with the Dorsett system. The conduit is very rough, scratching all the lead pipe from the cables when they are pulled through. We have no trouble in making our underground joints; we let the Western Electric do that for us. But on our aerial cables we have a plumber who makes those joints as Mr. Patterson has described. The only difficulty we have had with any underground system has been with the Brooks system. A short while ago 400 wires failed; we traced it to the terminals, where there was some water. We were compelled to draw the cable out and boil it. It worked well after being put back. Our insulation ranges from 500 megohms to 1 megohm. The Brooks system measures very much lower than that. The longest length of the Brooks is 1,900 feet. The static capacity ranges from $\frac{12}{100}$ to $\frac{13}{100}$ microfarad, and on moderate insulation, say one megohm per mile.

The President: What is the result of your investigation in regard to Brooks' cable as to cross talk?

Mr. Seeley: There is some cross-talk in Brooks cables. I never saw a cable yet but that there was some leakage or cross-talk. We are compelled to ground all the wires that are not in use. Of course that cuts down the cross-talk considerably. The president of our company has decided to use metallic circuits in the future for all our subscribers. Our cables will consist of the No. 18 Brown & Sharpe gauge with the static capacity of $\frac{21}{100}$ of a microfarad. Instead of putting 100 single wires in a cable we are going to put 100 metallic circuits in a cable. As the subscribers' lines are gradually turned into metallic circuits we will use the wires, and we will ground one side of the circuit until that time comes. We have cables in New York city, No. 14, No. 16, and No. 18 American gauge. We talk as well on a No. 18 wire as we do on a No. 14. We have no underground cables under 20. We have 20 miles Patterson cable—that is 20 and 26 wire. We also have some long kerite cables. The static capacity ranges from $\frac{25}{100}$ to $\frac{30}{100}$ of a microfarad. We have a cable running from our Brooklyn testing house to Mr. Sargent's exchange in Brooklyn, which has been there some 16 months—a Patterson cable. I think that is a No. 14 cable. They are grounded circuits. Our original intention was to use them as metallic circuits some future day.

Mr. E. J. Hall, Jr.: There has been an impression that we might, after a while, take out our cables and rearrange the connections, so as to adapt the present grounded circuits for metallic circuit use; but a little reflection will satisfy any one that that is not possible, when you come to think of the complications involved in doing any work on cables underground, and then imagine a conduit filled with lead cable. On the cable running through Sixth avenue, New York—about two miles—we tried the experiment practically of working a cable 2½ miles long, which is giving good results when used for grounded circuits. As a metallic circuit cable, the line worked so badly that we asked Mr. Eckert to take the conductors out of the cable and give us some overhead wires, which he did, and the trouble was removed. The difficulty was simply this: In working a grounded circuit through a cable, indiscriminately, 2¼ miles long, you have 2¼ miles of exposure of the conductor

to interference from other wires. When you bring the return conductor back through that cable, you have 4½ miles exposed to induction from single wires, for the reason that the wires in the metallic circuit are not affected equally by the disturbance. They are not parallel, and they are not made up with reference to the other wires in the cable You start in at one end, with No. 1 and No 2 wires immediately adjoining; but at the first joint the wires have been taken up, so that they do not continue in the same paralleled relation.

MR. SEELEY: The present condition of our underground cables, of course, is not satisfactory. If it was, we would not go to the enormous expense of making every subscriber a metallic circuit. We have more electric lights, more telegraph wires, and more of all kinds of induction in New York than anywhere else. Induction does not come from the underground cables; it is brought into the cables from the overhead wires.

MR. E. J. HALL, JR.: I would like to make one statement further, which, I think, may interest you. We recently worked a line between Philadelphia and New Haven, about 175 miles, in which there were about eighteen miles of cable, that cable being made up of serial, underground and underwater; fifteen miles of that was continuous at one time. That working on metallic circuit has been operated with entire satisfaction. So I do not think that we need fear in any of our cities we will strike a limit over which we cannot talk successfully, even though we used cables entirely.

MR. BENNETT: Was that an experimental test?

MR. HALL: Yes, sir.

MR. BENNETT: It has not been practically tested by subscribers, has it?

MR. HALL: The cables were connected up for the purpose of making this test.

MR. BENNETT: What will that do, practically, when you have got fifty subscribers in a 100 conductor cable to a metallic circuit?

MR. HALL: It will work just exactly as well if the cables are constructed with reference to using metallic circuits.

MR. BENNETT: The men who are putting their money in telephone stock want to get the best possible appliances they can, to continue the business practically. Two years ago there was nobody talking metallic circuits. You state in this convention that you have got so many miles of wire. You have got a subscriber 100 feet from your exchange. You tell us he is on a metallic circuit; that is 200 feet of underground work for that one subscriber. Why not simply say that you have so many subscribers and it takes so many miles of wire to those subscribers?

MR. SEELEY: I stated emphatically that our cables were in miles—eighteen miles of underground cable, not wire—longest length, two miles; shortest length, 1,900 feet.

MR. BENNETT: How many subscribers have you got on those wires?

MR. SEELEY: Three thousand.

MR. BENNETT: How many wires in a cable?

MR. SEELEY: From 400 to 100.

MR. BENNETT: How many wires for the 3,000 subscribers?

MR. SEELEY: Three thousand.

A Practical Motor Wanted.

We quite agree with the ELECTRICAL REVIEW, New York, that it would greatly assist in making domestic electric lighting more of a success if a convenient and practical motor of small size was perfected for such use. It is out of the question to employ an engineer for every house, and the care displayed by servants is noticeable, especially for its absence. There are on the market petroleum, steam and hot air engines, some of which, in the matter of constant speed, leave little to be desired. Purchasers have little to guide them in their selection, and they cannot afford the expense of elaborate tests. If these motors could be publicly tested, and the merits and demerits of each published, there would be a basis for guidance in purchasing and in improving the existing machines.—*English Invention, Aug.* 27, 1887.

* * The prize of $10,000 offered by the French Government for the most valuable discovery relating to the utilization of electricity is to be awarded next December. It is for any use or application of electricity, namely, as a source of heat, of light or of chemical action, as a means of transmission of mechanical power, or of verbal communication in any form, or, finally, as a curative agent.

Another New Telephone.

To the Editor of Electrical Review:

I received yesterday a visit from a person introducing himself as John B. Strong, brother of "the great discoverer," Henry C. Strong, a printer, who, in 1886 discovered at Galesburg, Ill., the Strong relay telephone, by which, "with concentrated magnetic polarity at both ends of a cable, music and articulate speech can be created at each pole, instantly, to any distance of the globe."

I thought, here we have again another telephone lying loose to be found by some lucky individual who happens to stumble over it. I wondered how many more unknown telephones are lying about here and there, waiting for lucky finders, to be discovered, like De Soto discovered the Mississippi. I expressed to my visitor my curiosity to know how that telephone that his brother discovered got in Galesburg, Ill, but the remark was not appreciated by him, and he proceeded with a string of uninterrupted long sentences; of which, as soon as he left, I wrote down what I remembered.

In this I was assisted by a circular which he left me, and which was entitled, "The Telegraphone, entered as second class matter and devoted to first-class scoundrelism." He showed me some colored drawings representing sections of the earth's interior, from the poles to its very center, explanatory of his brother's theory of the magneto-electric molecular tansive polarity proceeding from its center, by which without batteries, we can have instant verbal intercourse with the ends of this round world. When fairly started on the subject he went on. His peroration ran thus:

"I have been directed to you as a person who is known to be an authority in electrical matters, to communicate to you the great discovery made by my brother: namely, that there is no such a thing as electric currents; it is all polarity—it governs telegraphy and telephony by the natural creation of the conic sections, magnetic earth tension, and the electric molecular tansive creation that surrounds the earth; each having attraction as well as repulsion; positive and negative poles of a battery pay off magnetic polarity, which intensifies magnets, increases their powers of attraction and repulsion, from the fact that their contents are metallic—of the earth, earthly. Telephone magnets manifest the earth's polarity when suspended in the electric molecular polarity, because they have not a metallic connection with the earth; the wires around them being insulated, they become artificial poles, on a closed earth circuit, but are in the electric molecular polarity surrounding the earth, which is shut off from the attraction and repulsion in the end of a magnet by a metallic diaphragm. There is no such thing as a mechanical transmitter or receiver; the human telephone is both. Speech is the human triune magnetic molecular formation in and out of the electric molecular polarity which surrounds the earth, and always in contact with the ear diaphragm of living beings. When speech is evoked by the magnetic body, it is instantly in contact with the ear diaphragms within the magnetic human limits. We can communicate only as far as our magnetic field extends, but with a magnet behind the metallic diaphragm and it insulated from an earth connection, yet pervaded with magnetic earth's polarity, enables us to communicate wherever artificial poles can be made. Inorganic bodies, as to vitality, are of chemical magnetic earth's polarity creation, in which speech power is produced by the electric polarity's grand union with a magnetic earth's polarity at birth," etc., etc., etc., etc.

Here a dismal vision commenced to arise before my eyes; it was that of a picture extensively sold in New York a few years ago, representing a coffin with a corpse in it, bearing the inscription: "This man was talked to death." It impressed my mind in such a manner that I requested to be kindly excused from further explanation, but my visitor urgently invited me to accompany him to see some experiments, when he would be able to explain his brother's theory more extensively than he was able to do without the experiments. I requested to be excused, pleading urgent business, and politely dismissed my visitor, who said finally that his brother's telephone was patented in 1880, and that he was going to fight the Bell Company. The reader will see from the specimen of his talk communicated above, that if free speech is allowed to him in court he will be the most formidable opponent which Mr. Bell's lawyers have had thus far to contend with.

That the courts may have mercy upon them is the charitable wish of

P. H. VANDER WEYDE.

New York, Sept. 22, 1887.

The Effect of Heat on Magnetism.

In the September number of the *Phil. Mag.*, Mr. Herbert Tomlinson continues his account of researches on the physical properties of iron. He has now investigated the very interesting question whether the phenomenon of "recalescence" is or is not associated with the sudden loss of magnetic power which iron undergoes at a certain temperature. The investigation, therefore, comes very opportunely at a time when Edison is attempting to utilize the latter phenomenon for industrial purposes. It may be as well to give in a few words the history of the subject. In the year 1869, Mr. Gore brought before the Royal Society an experiment which showed that when iron had been raised to a bright red heat, its contraction on cooling did not proceed uniformly, but at a certain temperature it suddenly and momentarily expanded. In September, 1873, Prof. Barrett extended the observation by showing that the momentary expansion was accompanied by a momentary flash into more vivid redness, and further, that the effect was not obtained unless the iron was previously raised to a temperature considerably higher than that at which the visible effect takes place. The experiment can easily be made with a Bunsen burner and a sewing needle. Prof. Barrett was of opinion that this phenomenon—which he called "recalescence"—was associated with the loss or gain of magnetic properties. If this were true it would evidently tell seriously against the pyromagnetic dynamo. Mr. Tomlinson, working with more elaborate means of research, has arrived at the conclusion that "it by no means follows that the phenomenon of recalescence occurs with every specimen of iron at the critical temperature at which iron loses its magnetic properties;" and remarks that he has sometimes noticed "more than one evident accession of heat during the same cooling." The important observation was made that in very soft iron wire molecular disturbance (evinced by change of volume) occurs at a much higher temperature on cooling than with harder specimens, and recalescence does not then manifest itself. We are not aware that any observations have been made as to the difference between hard and soft iron (or steel) in respect of the temperatures at which their magnetic properties are lost. Mr. Tomlinson is silent upon this point. The conclusions arrived at are thus summarized at the end of the paper: (1.) There are two distinctly marked critical temperatures for iron: the lower somewhere about dull red, and the higher somewhere about bright red. (2.) At the former of these critical temperatures the iron begins suddenly to lose its magnetic properties if it is being heated, and to gain them if it is being cooled. (3.) At or near the latter critical temperature, the iron, on being heated, if under the slightest torsional, longitudinal, or flexural stress or strain, begins to exhibit a remarkably sudden change. If the metal be under stress, the sudden change resembles that which would result from a sudden increase of elasticity. If the metal be permanently strained, there is a sudden increase in the amount of the strain. (4.) When the iron is cooling a sudden change, but opposite in direction to that which occurs on heating, takes place. The temperature at which the sudden change takes place is, for very well annealed iron, nearly the same as that at which the change takes place on heating. If, however, the wire be not annealed, the change may be delayed by the so-called coercitive force of the metal until the lower critical temperature is reached. When the change is so delayed, the phenomenon of recalescence occurs.

The Shockophone.

To the Editor of Electrical Review.

The Western Wizard, Ed. Thomasson, has again forged to the front with one of his original and wonderful inventions. True genius is ever modest and retiring, and Ed. is no exception to the general rule.

Having heard incidentally of the fact that Ed. was engaged upon a new wonder—the news having been brought by Frank Jones' little bird in the telephone, the representative of the *News* was sent by the editor to steal the invention; or, perhaps, it is better to say interview the inventor and publish the result.

The emissary discovered his quarry, so to speak, in the back yard of his country residence—an adobe cottage and barn all in one piece—busily engaged in slicing up newspapers to an uniform size with a pair of tinner's snips. His unique occupation brought up that old Persian saying: "A wise man is prudent, a cunning man is cautious, but a genius is peculiar to oddity, even though he be not a fool."

As he recognized me his countenance beamed with its usual framework of smiles, and rising from the lowly tuft of tame pampas grass on which he was seated, he warmly greeted the intruding crayon wrestler. Then, gathering up the paper cuttings, which I had seen were all of the same date, and bore internal evidence of the same birthplace, he pointed and led the way to his cunning, sweet little laboratory over the stable, saying, as he did so, "We shall be more alone here." After a trifling delay in working the combination of a rope lock with which the sacred premises were secured, we entered and made ourselves severally comfortable upon a corn basket and an upturned straw cutter.

"I knew you were coming," began the Wizard, "and you of course have heard of my latest. Yes, sir," he continued, "it lays over everything yet from a philanthropic standpoint. No more deaths from the electric current. This little safeguard will cure all that sort of thing in the near future," and he produced from the inner pocket of his "tuckapaw" trousers a little block-shaped apparatus, which he informed me contained a megohm, whatever that may be. Attached to this at either end was a flexible cord terminating in an adjustable finger ring.

"Now," said Ed., "for direct currents these two rings are placed upon the middle fingers of the two hands, the shockophone rests on the back of the neck near the base of the brain. It is exactly there that D'Arsonval says lies the greatest danger. These two cords extend down the arms next the skin to the rings. Now, no matter how hard the shock would otherwise have been—you know, of course, that direct constant currents are far more dangerous than alternate impulses, especially when these are induced as well as alternate—the dissipating power of this megohm, separated as it is from these terminal rings by a peculiar paper insulation, thoroughly destroys the force of the shock. With this protection the entire current of a Thomson-Houston 500 arc machine could be taken with impunity on the tongue. I have one in Kansas City and Weeks is using it daily hunting for grounds by tasting. I should feel perfectly safe in a thunder storm, under a lone tree, with this on. When it comes to alternate currents, those generated from natural gas, the megohm is not actually necessary, the paper insulation being all-sufficient; but, of course, there must be provision made to meet the necessities of these terribly high (Thomson-Houston) currents, or President Morrison's smile when he is talking motors. The whole secret lies in the peculiar paper I use, the virtue of which I recently discovered. I was cutting it up into proper sizes when you came.

A gleam of solid satisfaction spread over the countenance of the Faber pushing emissary. I had discovered the awful secret. As I joyfully left the august presence, I unrolled one of the bits of paper I had concealed. It was part of the Pittsburg *Dispatch*.

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GEO. WORTHINGTON, - - - Editor.
CHARLES W. PRICE, Associate "
T. J. McTIGHE, Electrician and Manager Patent Bureau.
LOREN N. DOWNS, President.
ANDREW J. DAM, - Vice-Pres't and Treas.
C. C. HASKINS, } Consulting Electricians.
GEO. A. HAMILTON, }

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, OCTOBER 8, 1887.

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There's music in the electrical air.

Most assuredly the motto for this period of the world's race-horse progress should be *Nil admirari*.

When the intelligence of a disaster is flashed over the wires electrically, a newspaper very properly heads it "shocking news."

Induction systems, like bustles, are the style just now. And as they make electric lighting cheaper, the consumers are well pleased.

A fourteen-year old boy, in the New York Hebrew Technical Institute, has just completed an electric motor which he has designed to propel his sister's sewing machine. He has made every part himself since the first of August, at a cost of about nine dollars.

The alliance of the Thomson-Houston and Westinghouse electric companies is one of great vigor, strength and capacity. It means, we think, a devotion of all the energies of these companies to the proper advance of electric lighting—an ending of fruitless litigation.

The Hebrew Technical Institute, New York, expects to add a special course in electricity to their curriculum. Prof. Leipziger says that electricity is the factor of the age, and that in twenty years from now we shall hardly know ourselves for the wonders it will have accomplished.

We predict that the time is not far distant when there will not be found a steam engine under ten horse power in the manufacturing shops within reach of the generating stations of the electric light companies. Electric motors will be the source of power, and the lighting companies cannot spend their spare energies to better purpose than encouraging the rental of motors to the utmost extent. Let any company calculate the receipts on investment if their full generating capacity can be utilized thus during the greater part of the 24 hours, and they will find enough incentive to push the matter vigorously.

We are compelled to take exception to our St. Louis correspondent's statement in his letter of Sept. 23, 1887, wherein he writes of the new Edison lamp, "and should it prove successful, will tend to revive business considerably." Possibly local business in St. Louis may be drooping and need reviving; but such is not the case in the country at large. The fact is, the business of electric lighting is very much alive just now, and there is such a demand for new plants, and supplies for old plants that the manufacturers in nearly every instance are crowded with orders which will tax their utmost energy to fill in the next six months. Electric lighting, in the United States, at least, needs no "snuffing," like the candle of our ancestors.

Only a short time ago we had wonderful accounts of photographing cats and things on somebody by lightning. Lightning will have to hurry if it gets much ahead of the electric light. A night dynamo man, so the story goes, was very intimately acquainted with two ladies, one of whom is his wife. The latter saw him mostly at home—the former didn't. One night not long ago, when it rained, and the lines were heavily grounded, the other lady dropped in at the station, and on account of the rain stayed longer than was her custom. Just before she departed, passing near the dynamo, she came in contact with the electric machinery in some way, and received a terrible shock, from which her friend rescued her, he also being considerably injured by the current. The dynamo man thought no more of it until the next morning, when his wife called him to breakfast, and showed him a fine photograph of number two, which had fallen out of his coat pocket. The picture had been done by the current at the instant he rescued his friend from her perilous position. This was the dynamo man's explanation of the phenomena.

ELECTRICITY'S ONWARD MARCH.

The age of electricity is fast dropping the signs of adolescence and is assuming the garb and appearance of vigorous manhood. Everywhere the growth is going on, and the young giant is making his strength felt in all directions. The development of this last offspring of the nineteenth century has been more wonderful than that of any of the progeny of the ages, and withal is only now beginning to receive the nutriment it requires—the earnest study and attention of the whole scientific and practical world. Many other natural forces need development and improvement. Look at the generation and utilization of steam to-day after its years upon years of study by our greatest engineers. And to-day it would be foolish to expect from an ordinary steam plant a return of twenty-five per cent. of the energy stored in the coal. Yet who would dare assert that nothing better can be reached? An army of most thorough and skillful electricians are at work making the electrical field a very hive of industry, working out a few of the vast number of electro-mechanical and electro-chemical problems that are yet to be solved, and in their solution to place the solvers' names high on the pedestal of fame.

Electric motors by the thousand are daily humming their little songs of domestic usefulness; dynamos groan nightly to give us our midnight suns, and glow lamps by the million bespangle the world. Our newspapers live by the telegraph, and the telephone puts the land in a buzz of conversation. These fields are, in their own specific development, pretty well cultivated. But there are others by the hundred, with but a few earnest toilers turning up the sod and clearing away the rubbish. In these higher paths of electro-technique there is incalculable good to be done. Our college students cannot do better than boldly adopt electricity as their future profession, and with every nerve and fiber struggle for the acquirement of such knowledge as will fit them for places among the electricians of the future, some of whom are bound to become famous for all time.

ELECTRICAL EMPLOYES.

Talking with an old electric light man the other day, he expressed an opinion on linemen in general, and general linemen in particular. He says he would rather take a sailor or a shoemaker that never saw an electric light, and teach him, than to worry and stew with a man who starts in with knowing better than the inspector how the wire should be run and insulated. The average lineman who has done work for a month or so on telephone or telegraph lines always knows that his boss holds a full hand for simplicity, and he never does as he is instructed if he can possibly help it. If you can get hold of an able-bodied man who is willing to work, and hardly dares touch an insulator for fear it will bite, you can teach that fellow, and he will be ready to learn; but the man who has handled miles of wire—naked at that—for the Ohm and Volt Telegraph Co., or has run thousands of miles of wires for the Farad and Coulomb Telephone Co., and never got a shock, is far better let alone. His knowledge passeth all understanding, and, what is more, as a rule a telegraph or telephone tramp has but two ends in life—pay day and quitting time. But when you get into a snap and advertise for competent men, and are answered by a fellow that you saw last week hanging round a bell-hanger's establishment, or sitting bolt upright on a hack, playing driver, the straw is grown that will break the poor electric light camel's back.

THE ASTOUNDING ELECTRIC EFFECT OF A TELEPHONE IN INDIANA.

An electric light wire became crossed with a telephone wire in Logansport, Ind. The telephone line ended in a saloon, and the veracious witnesses to the result of the disaster state that the flames issued out of the "mouth" of the telephone a "distance of twenty-five feet, while the entire instrument assumed the appearance of a locomotive head light." Please pass the medal to Logansport.

OUR CHICAGO LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

A long time ago, to begin as fairy tales begin, the question of perpetual motion was up, when the case of a revolving light on some lone rock in the sea, which was kept in motion by the rise and fall of the tide, was brought up as an exemplification of the possibility of perpetual motion, and when this was denied the gentleman who cited the instance was kind enough to remark, "Well, you sit there and watch it until it stops, and you'll believe it is before you are through with the job."

Frenchmen are working—have been for some time—trying to make use of the winds and waves to run dynamos to charge batteries to light their lighthouses with. A sort of a "this is the house that Jack built" story. They will do it, and they will have near enough to a perpetual motion to make any nervous man very tired who undertakes to watch it to the finish. It will come, sure as ballooning will result from the use of an exhausted receiver in place of a hydrogen-filled vessel—yes, even as certain as that a woman will always get off a street car backwards. The present series of experiments are being made under government supervision at the Cap de la Hève, near the mouth of the Seine.

Detroit, Mich., is having a terrible how-dye-do with the underground question. The council remarked to the electric light people, "You go down below." The electric light chaps said, "No, sirs; we are here on deck, and here we stay." Then the municipal authorities proved conclusively that underground could be made a success—that underground wires were working successfully in other cities, and the Brush people at once produce refutations of the statements of the officials, emanating from electric light people in the cities referred to; and that although the wires had been so buried they had not stayed buried, but, potato like, had come to the surface soon after planting. However much that may be true in some other cities, it is a dead sure truth, 24 karats fine, that no wires have ever got back into daylight, once they went below in Chicago. The electrical climate here is different.

A committee of the Detroit council is to swing round the circle, and find out which boy told—the truth.

In New Orleans there seems to be no lack of trouble with overhead wires. A few days since a lineman of one company, while employed on a pole, so managed as to get a fall and lie across the two wires of a system using an alternate current in which the wires are necessarily run close together. The man lay suspended some five minutes before the machinery was stopped, during which time the current passed through his body from the inside of one thigh to the upper ribs on the other side, the flesh being burned to the bone in both places. Of course the man was dead when removed.

Again on the 20th the same sort of an accident occurred, this time without fatal effects. The victim was knocked off the pole by a shock from the same or a similar system. The shocking was fortunately not of as long duration, but was serious enough.

While at it, let us have one from Lincoln, Neb. This time it is an arc light plant. A workingman named Smith, at the corner of O and 9th streets saw a telephone wire lying on the ground, having a little Fourth of July of its own in the way of sparks and blazes. The poor fellow knew no harm in picking it up, and the usual result followed. The hand closed on the wire, which burned to the bone, and in his writhings the wire came in contact with one of his eyes, which it burned out, while at the same time it tore open the side of his face. Wherever it hit his flesh it cut like a knife. Another party, striving to save him and not knowing how, came near being killed for his pains. The wire finally got away from him and the poor fellow was taken to the hospital, more dead than alive, and it was not probable he could recover.

This is one of that class of currents they

used to tell us were perfectly safe—a "safety system," as one of these was once known to readers of advertisements. Thank heaven, or progress, or something, we have arrived at that point when the public are better posted on all this matter of electric light dangers, and while the victims, numerically, count more per annum than formerly, pro rata for the number of lights burning to-day they are far less than then. Let us be duly appreciative and thankful.

At the Grand Army Reunion, at St. Louis, where a lot of old rheumatic vets (to whom all honor) thought they must play boy, and sleep in tents in the rain, because they had to in '61–'64, there was a gay and jolly crowd from way over on the west coast, who, like the New England farmer of the olden time, brought in a little fruit and things to general muster, by way of paying expenses and advertising a boom.

The boys couldn't get along without the 'lectric light, and they made a requisition on the Western Electric (Maj. Young); and before hardly any one found it out, the cable loop was laid over a mile, the lamps were hung, and, amid the plaudits and cheers of the boys who wore the blue in the days that are gone, the thirty lamps lighted up the California soldier fruit show with electric juice, generated a couple of miles away.

John says that he has heard "Marching through Georgia" many times; but he never heard it in so many different keys, and shapes, and rates of time, and intonation, and national accents as there. But the boys had good reason for it. They who stayed at home, or were born since, should raise no voice of derision for something they cannot understand.

More fun is reported from the Indiana telephone battle ground. L. C. Dunseth was arrested a few nights since at Lafayette, under the law which has made so many men risk their Calvinistic reputations when talking of these matters. The charge against Mr. D. is that he overcharged—exceeded the $3 limit fixed by law. This is the first case, and it is not improbable others may follow.

A new organization has just been incorporated at East St. Louis, Ill., for the manufacture of and dealing in all forms of electric machinery. E. W. Pike, N. O. Gray, and S. B. Pike are the incorporators of the Pike Electric Company, the capital stock of which is $25,000.

"The course of true love never did run smooth;" not even the plausible flat iron of the prospective mother-in-law is powerful to take out its wrinkles. Neither is the telephone control of the river traffic of Chicago. There is a lot of red-eyed, "up with the lark" sort of ducks that don't want the bridges open from 5 to 7; and another lot of pink eyes that want to be on hand at 7.30 at the shop or the factory; there is a lot of pets and dudes who have to be at the store at 8; a lot of bankers' clerks who want to report at half-past; and a well-fed lot of bay windows on legs, and beer barrels on stilts, that want to get around to bank, beef, and oleomargarine business about the middle of the forenoon; and there isn't one out of all these lots who isn't ready to swear, from the damsel with "two lovely black eyes," who says, "jam the jam thing to jell" every time she makes preserves, to the bluff old proprietor of some pickle factory or soap monopoly, that "that 'ere bridge is jest open over three quarters of the time for those 'ere vessels. The vessel men jest own the city."

Per contra, there is a large and red-nosed vessel interest which feels that somewhere outside the dark watches of the night, there should be a time when the water craft may enter the river and rest.

The telephone handles the matter well enough for the majority—but one grumbler on either side can make a fearful row, and grumbling is very much like scratching in a district school. Experience has shown that grumbling is as necessary to the prosperity of the city as fertilizers are to a market garden.

The telephone government of the vessels is to be a little differently arranged. This will give one class of grumblers a rest and time to recuperate, and let another lot have a chance at the bellows for a time. There is nothing like spelling the job where you have plenty of help. First thing anybody knows the bridges will be closed all day and open pretty much all night; and then there will be a fresh breeze that will smell like an all-night hack, or beer garden music. We shall see.

Near Lorain, Obio, lives a young lady named Harmon, who visited an electric light plant at Cleveland some time ago, accompanied by her affianced husband. While passing near the dynamo she was brought into circuit by means of the wire bustle she wore, which in some way had become disarranged. Resting her hand upon some bar or frame at the same time completed the derived circuit to ground, and the result was a severe shock, which prostrated her, and she fell, breaking the circuit. Paralysis continued for four days, when she was removed to her home, where, after a month or so, she was enabled to attend to her ordinary household duties. But from a plump, rosy-cheeked farm lass of nineteen, a sweet-tempered, amiable girl, she was, in that one instant, completely changed, and now seems like a worn-out woman of sixty. Her voice is cracked, and her hearing is almost gone. The course of the current, from the bustle up to and through the arms, lay along the spinal cord; and physicians claim that the excessive nervous action, due to the concentrated electrical force, has accomplished what ordinary wear and tear could only have accomplished in a lifetime.

An extraordinary test was made on Friday last, at the new plant in the Phœnix Building. Three four hundred light Edison dynamos, with 1,381 16 candle power lamps, were run for ten consecutive hours, in the most satisfactory manner. A separate test, of half an hour each, had been made with the three dynamos independently, with 502 lamps. The test was made for the benefit of the contractors and owners of the building, which had previously been examined, and certificate given by the City Inspector.

CHICAGO, Oct. 3, 1887.

——The Waldumer electric brake was subjected to a series of tests on the C., W. & B. road near Cincinnati on the 27th and 28th Sept., on a grade of 68 feet per mile. An expert, appointed by the railway commissioner of Ohio, supervised the tests. A number of engineers and railway men were present and assisted in the tests. We are advised that very satisfactory results were obtained, and that a full account will be made public in the shape of an official report

—— The telegraph operators in the various local offices are excited over the engagement of a number of operators in New York by the Mitkiewicz-Barker Chinese telegraph and telephone syndicate. E. Barberie, an old operator who recently returned from China with Mitkiewicz and the Chinese Legation, is hiring the men. The syndicate, it is said, is offering $200 per month and free passage to China for good operators, and as, outside of the desire for a change, the price offered is almost three times as great as first-class wages here, there are not a few operators who have expressed a desire to engage with the syndicate.

—— Metallic alloys form the subject of four English patents issued to Mr. Charles Auguste Paillard, of Geneva, Switzerland. The materials composing the alloys are palladium, copper, nickel, gold, platinum, silver, steel, and iron, some of the alloys having only a few of these ingredients, and all of them being in varying proportions, with special methods for their combination. The object sought by this invention is to make metallic alloys especially adapted for different parts of clock, chronometer, and fine watch work, which shall be neither oxidizable nor magnetic, with small capabilities of dilatation, and having hardness and elasticity, and more or less of the properties of steel, according to the particular use to which the alloy is to be put, and the grade of watch, clock, or chronometer to be made therewith.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The housewarming of the Electric Club takes place at the club house, 66 Boylston street, Wednesday evening, Oct. 5, from 8 to 11 P. M., under the direction of the House and Entertainment Committee.

The Tremont Electric Light Company are building a 50 by 100 feet four-story factory at the corner of Congress and A streets, South Boston, which will be ready for occupancy Nov. 1. The company are at present much crowded for room. The basement of the new factory will be fitted up as a central station. Already 1,000 incandescent and 30 arc lamps have been engaged. Two 60 horse power Ball automatic engines will be used. Among the recent sales of isolated plants are one of 75 lights, Coates Clipper Manufacturing Company, Worcester, Mass., and another, of 150, for the Wachusett Shirt Company, Leominster, Mass.

The Sprague Electric Railway and Motor Company have sold a 15 horse power motor to Carter, Rice & Co., for two paper elevators, and also to Jos. N. Fish, 31 South street, for elevator and shoe machinery. A combination fan is being made, whereby the motor is fitted to the axle of the fan, and is protected and concealed within the body of the fan.

Messrs. Claflin & Kimball, 143 Federal street, New England agents for the Mather Company, have begun what will result in a large central station. A 300 light, 120 volt Mather dynamo, driven by a 25 horse power Westinghouse engine, supplies current for incandescent lamps in the block where it is located, and to a few customers on Devonshire street. Mains are run from the dynamos to the top of the building, and thence separate leads supply each customer. It is, therefore, only necessary to maintain a constant electrical pressure at the dynamo terminals. The dynamo, with full load, runs without perceptible sparking at the brushes.

The town of Hyde Park, Mass., is to be lighted with arc lights of the American system. The same system, through the agency of Mr. Samuel Elder, has been accepted by the Board of Aldermen and City Council of Lewiston, Maine. 100 arc lights, 2,000 candle power, will be placed in the streets at once. This is the first case that a city or town has bought its own plant, and its example will undoubtedly be followed in many other places.

Early in the summer Mr. E. W. Gross, of Auburn, Me., purchased a valuable mill privilege on the Little Androscoggin, which empties into the Androscoggin, a short distance above Lewiston and Auburn. The American system of arc lighting will be used, and 200 lamps put into commercial use at once. It is intended to furnish incandescent light, and operate electric motors for power purposes. The slight cost for water power will enable this to be done at an extremely low rate for the consumer, and with profit to the owners of the plant.

BOSTON, Oct. 4.

A New Helio-Telegraph Instrument.

Lieut. John P. Findlay, Assistant Chief Signal Officer, United States Army, is in Troy, N. Y., superintending the completion and testing of a new helio-telegraph instrument, of which he is the inventor. The machine is applicable to any code and the arrangements are such as to preclude an error in the sending or receiving of a dispatch without gross negligence on the part of the operator. It consists of a double mirror by day or two powerful lights by night arranged at the ends of a bar. The flashes are made by keys and levers, a dot being sent by a single light and a dash by two lights combined. The instrument combines the telescope level and signaling apparatus in one, instead of the separate instruments heretofore in use. Modifications of the instrument fit it for use in fortifications and in coast survey work.

ELECTRIC CLUB NOTES.

Mr. Chas. Selden, of Baltimore, and R. F. Ross, of Boston, were club visitors this week.

Prof. F. B. Badt, an able electrician of Chicago, was a visitor at the club rooms the past week.

The next regular meeting of the club will be held at the parlors in the Hotel Dam, Thursday evening, October 20.

There are scores of applicants for the position of steward of the club. The House Committee has made no decision.

A beautiful bronze statue of electricity has been presented the club by one of its liberal-hearted members. This is the first statue of the kind ever made.

Mr. Henry Hine, chairman of the Membership Committee, has returned, browned and invigorated, from a vacation devoted to fishing on the St. Lawrence.

The Edison Company has very kindly agreed to connect their central station circuit with the club house, thus assuring electric lighting under all contingencies.

The bonds of the club are being taken very promptly by the subscribers. The trustees allege that their beautiful signatures (500 in number) are what cause the rush.

The Okonite and New York Insulated Wire companies have very generously marked all their bills for wire furnished with that very pleasant word "complimentary."

"Electric pills" is the latest tid-bit. Four members of the Electric Club recently partook of a dinner garnished with pills, and pronounced the mixture very appetizing.

It is proposed to present at the new club house opening a list of the holders of the bonds of the club, and of those public-spirited gentlemen who have made valuable presents.

President Bracken, of the Julien Company, who has been summering in Europe, sailed for New York last Saturday, and will be here in time to participate in the club house opening.

Mr. A. H. Patterson, manager of the Phœnix Glass Works, has presented the club with shades and globes for all electric fixtures. This is a most creditable gift, and insures the best quality of goods.

President Davis is a direct blood descendant of Benjamin Franklin. The appropriateness of his selection as well as some of the reasons of the success of the organization under his leadership are now accounted for.

Prof. Waldo, of Yale, will deliver an address before the Electric Club at the next meeting, October 20th. The members will be privileged to listen to an interesting, entertaining and instructive address, and we bespeak for the talented speaker a large audience.

The many friends of Mr. A. C. Smith, secretary of the Geneva Non-Magnetic Watch Company, will be glad to welcome him back after an absence of several weeks. Mr. Smith takes an active interest in the success of the club, and has aided greatly in promoting its interests.

The boiler furnished the club by Mr. N. W. Pratt, manager of the Babcock & Wilcox Company, is now in place, and roofed. It is specially lettered "The Electric Club," and is one of the company's standard water tube boilers. Through the courtesy of Mr. Pratt, who is a member of the club, the boiler was furnished at a very low figure, and bonds of the club taken in payment.

The story in the daily press stating that at Westfield, Mass., toads gather under the electric lights, attracted by their brilliancy, and spend their time in fruitless jumping after the shadows of insects thrown upon the ground, is no more wonderful than that of the fly in the school who was cruelly deceived by the artistic excellence of the fly painted by the school boy, as related by Mr. F. A. Gilbert at the annual dinner of the Electric Club.

Telephonic News

*** The Long-Distance Telephone Company has completed its Boston line as far as Springfield, Mass. Twenty-one wires are being strung.

*** In Elk county, Pa., Henry Bayard & Co. are said to be issuing an infringing telephone, and the Bell Company and the Pittsburgh Company have commenced suit.

*** Charles J. Glidden relinquishes the treasuryship of the Erie Telephone Company on the 15th of October, and becomes a member of the firm of Cordley, Young & Fuller, stock brokers, with offices in Boston and Lowell, Mass.

*** At a recent meeting of the London Society of Telegraph Engineers, Professor Hughes gave some particulars of an experiment he made by submerging a microphone in a public bath. By the unassisted ear no sounds could be distinguished; but by the aid of the microphone a great confusion of sounds was revealed, doors being shut, footsteps, voices, water flowing—all mingled together. This proved the vibratory power of water, and a practical application of the phenomenon is found in the fact that the microphone is now part of the regular equipment of officers of certain water companies in Germany, where it is used to detect leakage from the pipes by the noise of the water-flow.

*** It remains to be seen whether the Government will carry up the Pan-Electric Telephone suit to the Supreme Court. It would seem that the President and his cabinet would regard the decision as an excellent loophole through which to escape from a very unpleasant predicament. Every question of Attorney-General Garland's improper interest in the matter, through his ownership of Pan-Electric stock, must be raised again, and with even stronger emphasis than before, if the Government should appeal the case. As it stands, the administration may say with good grace that, having served what is believed to be a public interest in giving the court an opportunity to say whether it had the right to prosecute a patentee for fraud, and having been answered in the negative, it has discharged its full duty.

*** Solicitor General Jenks, speaking of the recent telephone decision and the probability of appealing the case, says: "I do not see what else the Government can do without admitting itself in error in all the points it has raised, and giving up the fight. What the issue will be I do not know, of course, but we shall continue to hope till the last chance is extinguished * * * I do not assume to say when the decision was made; all I know is that we had the disagreeable surprise then which has only just now burst upon the public at large. Judge Colt has followed, I should say, with great literalness, the decision of Judge Shepley in the Rhode Island case where Attorney-General Williams brought suit *ex rel.* Hacker against the Rumford Chemical Works. Judge Shepley took the broad ground that the Government was vested with no power to dissolve a patent it had once issued."

*** A writer in the Boston *Transcript* says: After reading the interesting account you give in this evening's paper of the decision in the case of the United States *vs.* the Bell Telephone Company, I was further interested in the reputed remarks quoted as from "a well-known gentleman—immediately cognizant of the claims and evidence on both sides"—and must say, that for a well-known gentleman, so well informed, he is the fullest of misinformation of any man I have heard of lately. If the gentleman was well informed, he would know that there is no statute in law whereby such a suit could be brought, and that it is the law that makes a thing criminal which otherwise is not. And further, this well-informed gentleman should know, the question of fraud may be raised in any infringement case, and as a matter of fact, the whole matter of the alleged fraud was an important theme of the Pan-Electric case in the Circuit Court at New Orleans, and is now in the appealed cases before the Supreme Court at Washington; so that the country is still safe from patent sharps and raiders who cannot "escape with immunity" or with boodle. But when the well-informed gentleman goes on to elucidate the further wickedness of the Bell Company, who, it seems, is not content with winning suits in an honorable way before the courts of our land, and tells us of the wonderful fact, known only to him, and that "indirectly" "by a good source," that "the Massachusetts company in which the patent vests had sold out its State rights and licenses to operating companies in every State but its own;" and that this "looks like sharp practice, and might weigh in the decision as to State jurisdiction," and that the Government should seek power in the District of Columbia, where a record of patents is made; why, when we read all this wickedness, we say it kindly, but firmly, we must really part company with our well informed gentleman. It is a fact of common knowledge that the New England Telephone Company and the Southern Massachusetts Company divide the State of Massachusetts between them, by means of licenses from the Bell Telephone Company, and that the Bell Company does no business anywhere directly, but in all cases through its licensees. So there is no sharp practice on the part of the American Bell Telephone Company—a corporation which has from the first been directed, managed and owned by some of the best and most honorable business men in our city and State; and it is rather late in the day for "well-informed" or other so-called gentlemen in this community to stigmatize a successful business undertaking, because, forsooth, it is based upon patents. If people do not like business based upon patents, they should labor to annul our patent laws; while they remain in force, advantage will be taken by "sharp" men to invest their money under the protection offered thereby—and so build themselves up and the community. I do not write in the special interest of the Bell Company—they have shown a disposition to care for themselves in a way far superior to any I possess—but in the interest of the patent system generally, and I can see that all inventors and business based on their patents have a lively interest in the sustaining of a just patent, as I believe the Bell patent to be; and the defeat of a most unscrupulous gang of pirates who had secured the assistance of the National Government to crush out a legitimate business in order that they might reap the fruits of its ingenuity and hard work.

Bucket Shops in Chicago.

The open board and bucket shop comedy is still on at the law shop amusement places. The volunteer corps, comprising the above-named arms of the service, have been granted leave by the Supreme Court to file a petition for a mandamus against the Board of Trade, Western Union, Gold and Stock, Baltimore and Ohio, and Postal Telegraph companies, and the Commercial Quotation Company, to compel these organizations to furnish him and the public generally with market quotations in as full and speedy a manner as the same have been furnished heretofore, and to permit the full and free transmission of such quotations by the telegraph companies. The summons is made returnable at the March term next.

In the meantime, by way of lunch—sort o' business lunch, as it were:

"Capt. Scott sits in Skakel's office, recently cut off from quotations by the Board of Trade, and gets the desired figures from somewhere within a second, and sends them broadcast to the bucket shops. It is alleged that he sends his messages by the Western Union tube, and that the service for him is more prompt than for any member of the board who may send the same figures to the same parties."

"Where in —— does he get 'em?" asked one of the regulars.

"I don't know that that is where he does get 'em. But if it is, the devil must furnish 'em, I s'pose," was the answer.

The "Wire Gauge."

BEFORE THE NATIONAL TELEPHONE EXCHANGE ASSOCIATION, PITTSBURGH, SEPT. 27TH.

PRESIDENT METZGER: The first paper to be read to-day is by Mr. Allen V. Garratt—an explanation of the new system of designating and ordering wire.

MR. GARRATT: Mr. President and members of the National Telephone Exchange Association: When I received the very courteous invitation through your secretary to address you to-day, I was pleased with it as a mark of personal attention. Upon a moment's reflection, however, I saw that it was dictated by a desire to call out the opinion and attitude of the National Electric Light Association in regard to the subject of wire gauge, and therefore I say in the name of that body, greeting, I shall, so far as possible, voice their views, keeping out of the question what I may personally think or believe. When he stood up to advance those principles of astronomical science that have since made him world renowned, Sir John Herschel said that when any student enters upon a scientific pursuit, especially at a somewhat advanced period of life, he will find that he not only has much to learn, but much also to unlearn, and as a first preparation, therefore, for the course he is about to commence, he must loosen his hold on all crude and hastily adopted notions and must strengthen himself by something of an effort and a resolve for the unprejudiced admission of any conclusion which shall appear to be supported by careful observation and logical deduction, even should it prove of a nature adverse to notions he may have formed for himself or have taken up without consideration upon the credit of others That, in fact, is the beginning of that intellectual discipline which forms one of the most important ends of all science. So I would say to you to-day, let us lay aside the traditions which are the common stock of us all in regard to the subject of gauging wires and look at it from a broader standpoint. We are all sick of the wire gauge question—at all events the electric light men are; I do not know how it may be with the telephone men, because it seems to be a matter of infinite perplexity, and the more we discuss it and the more we legislate about it, the less we really accomplish; and perhaps the first thing which the National Electric Light Association resolved is this, that there is no use at all in attempting to legislate about wire gauges. Such legislation seems to have no more effect than the wind blowing over the house. This association has practically so resolved. In 1886 the Electric Light Association passed such a resolution. Such attempts proved thoroughly fruitless, and we abandoned them entirely. The next thing we made up our mind to was that we did not want a gauge any way. It seems to be the tendency of the age to express dimensions of all kinds, in trades, by the simplest possible application of the best unit of measure. That belief we have come to from having corresponded with nearly everybody who was personally interested in this subject, and the almost universal reply to letters sent out upon the wire gauge question has been, that they wished to hear nothing more of wire gauges. Perhaps the next most common reply was, we prefer to designate our wires by their simple diameters, and usually the reply was expressed in the thousandths of an inch. Personally I have corresponded with nearly all the wire makers, drawers, coverers and electric light companies in regard to the use of the metric system, and I find the objection is raised that they are unfamiliar with the meter. Few men carry a mental picture of how long it is. They cannot put their hands out and say, that is a meter. But when I asked them: Can you tell how long a thousandth of an inch is? the reply was: No, we cannot do that either. Can you draw on a piece of paper twenty-seven thousandths of an inch? No. Well, isn't it just as unfamiliar a unit to you as a millimeter? Yes. They say it is. That small unit of a thousandth of an inch is an unfamiliar one to almost every one, except machinists who are working to thousandths of an inch in construction at all times; and we have come to the conclusion that that unfamiliar unit is not particularly in the way of adopting a system which shall include its use. Six months ago, at Philadelphia, I presented a view something the same as I have this morning, only elaborated in a long argument, which would be impertinent here; and I was instructed by the National Electric Light Associatson to go ahead with my associates, and prepare a mathematical table, based upon the views adopted at that convention. I have done so; and through the courtesy of the ELECTRICAL REVIEW, who own an electrotype of it, it is before you this morning. I suppose there is nothing that I know so little about as the telephone. I do not know anything about your requirements for wire, or how close you have to work, or whether you have to work at all by sizes of wire or anything of the kind. In incandescent electric light work it is a matter of the most vital importance. We are obliged to work to the utmost nicety in regard to the size of wires, and I am familiar with those requirements, and could present them here; but, I take it, it would be a matter of no interest whatever, and hence I will not enter upon the subject at all. I understand that in telephoning the question of static capacity comes in in your engineering work. I much regret my inability to speak upon that subject. It is something entirely out of my field of work, and, other than the ordinary theoretical principles, I know nothing whatever about it. I trust that it will be brought up upon this floor, and will be discussed. About all I can say in regard to these tables is in regard to the way they were made up. Of course, in introducing a thing of this kind, we had to be extremely careful that the utmost nicety of accuracy should be used. Nearly all the gauge questions of wire fall back upon weight against conductivity, or conductivity against weight. The figures used in this compilation of conductivity, or rather its reciprocal resistance, was the last authoritative determination in regard to the legal ohm. The work was calculated independently by three members of the committee, so that the table you see before you is not the result of one calculation, but the result of three independent calculations. Of course they did not agree at all points. Where they did not agree, I myself independently calculated those same sizes on different days, so that I might have forgotten the figures, and if both of my calculations agreed with either of the others, the rest of the committee went over the figures and they were adopted. That style of work has gone through the entire table. So I suppose I may say without egotism that it is an accurate set of figures. It was not printed from type; it was printed from electrotype, where there was no possibility of dropping out of type afterwards. Hence I suppose we may look upon it as a fairly accurate compilation. The idea of our association in regard to its use is this—not to adopt it as a gauge. You cannot expect the workman in our shops to carry about this great piece of paper in his pocket and base all his work upon it. We realize that the introduction of anything of this kind cannot be revolutionary, any more than forms of government can be revolutionary—or only exceptionally so. It must be a question of slow growth, and the electric light men, as represented in their convention have virtually voted to do this—to accept these figures as the work of their committee, and in so far as they can do so without directly interfering with their business workings, to specify such wires as these may require in their simple diameter expressed in the tenth of a millimeter and to use the figures which are set opposite those numbers of resistance, weight and so on, as the legal resistance, weight, etc., of wires of that particular size. That you will see is an extremely conservative position to take. It was so, and I have heard gentlemen say to me, Mr. Garratt, I am sorry that the National Electric Light Association did not adopt in a more positive way the work which you spent so much time in preparing; and I have replied honestly, as I say now, that I think the National Electric Light Association went as far as conservative men could go in a question of this kind, and their idea in using it is this—where the even tenths of a millimeter brings a wire sufficiently close to the wire they want, order directly by the number which appears on column one at the left, which we call the gauge number. There is really no gauge. You will notice No. 19 is one and nine-tenths of a millimer. In telegraphing it is difficult to make telegraph operators put in a decimal point. A decimal point is always a possibility of error, and it is simpler to say No. 19. So there is a definite set of consecutive numbers which may be used in ordinary work. In talking with a great diversity of people on this subject, I find this—they say that the telephone men will have certain sizes of wire which they must use; the incandescent light men of one particular system must have wires of a certain size; the arc light men will have another; men who make hairpins will have another. They do not care anything about gauge; simply give them something whereby they can express wires of a particular size in the simplest possible way. Now in regard to the smaller part of this gauge, in the numbers reading from 1 up to 10 and so on, I received, I suppose, a bushel or two of letters from gentlemen—courteous letters which I have been glad to receive stating, "Your numbers do not come close enough together; we have six numbers in the Birmingham between the two smallest numbers of this gauge." That is very true. It so happens that neither of those Birmingham numbers, however, exactly correspond with what you want. So, instead of ordering No. 1 wire (metric) it is very probable

that a man ordering wire of a small size would specify .123, which would mean 123 tenths of a millimeter. By the simple rule of three, as one is to the property it possesses (see table), so will one to 1.23 be to the property you want to find out. By a simple proportion from this table you have here you can almost instantly calculate the physical and electrical property of any wire that you want. That is the way that such a table has to be used. I have not the remotest idea that in the very small wires any gauge will ever be adhered to. To my knowledge there are some 14 Birmingham gauges in use in England. By that I mean there are some 14 different makers who sell wires on what they call the Birmingham gauge, that differ from one another. In this country the Brown & Sharpe gauge is not accurately used by makers. Wire drawers, who do not live a thousand miles away from Messrs. Brown & Sharpe, differ much from Brown & Sharpe themselves in the size of their wires, which they list under B. & S. numbers. There is one wire maker who draws excellent wire, and whom I greatly esteem, and on his table more than half the sizes of wire that he gives differ from the same sizes given by Messrs. Brown & Sharpe themselves. Those arbitrary gauges to-day mean almost nothing. You can take your micrometer screw and go into any large dealer's shop and say you want No. 23 Brown & Sharpe wire, and they will show you a lot of it; and if you want to work finely in incandescent work you can pick out just the wire you want. I mentioned 23 because that is a number they do not ordinarily carry. Those numbers are not drawn absolutely, I am told by wiremen. It is impossible, perhaps, to draw them so. So that after all an arbitrary number means but very little. That I merely introduced as an argument against a rigid adherence to an arbitrary number which bears no relation whatever to electrical or physical properties of the wire you are going to designate. I do not think you will care, gentlemen, to have me go into these various tables here, which were prepared almost exclusively for electric light work. The length per weight, of course, is a very pertinent thing to a telephone line, and also the weight per mile. The sectional area and diameters are matters of simple mathematical calculation. I would say, by the way, that not only were these calculations made by different members of the committee, but calculated by different formulæ. Of course that made a check against any possible accident in this question of area. But the conductivity against the length and weight, I take it, is not of so much interest to you. Along to the right the schedule of logarithms of sectional area, etc., is introduced for the benefit of mathematicians and electricians, to save them the trouble of hunting up the logarithm. This column No. 16 is simply put in for incandescent linemen From that number it is the simplest thing in the world to calculate roughly the questions of resistance and conductivity. Over to the right, to familiarize ourselves with this way of designating in comparison with Brown & Sharpe and the Birmingham, I have put tables of the nearest corresponding number of the Brown & Sharpe and Birmingham gauges, and where there are half a dozen numbers of Brown & Shape and Birmingham that correspond to one of this metric table, I have figured that very accurately, so that where it leaves off No. 3 and begins No. 4 of Brown & Sharpe's gauge, that is figured out to a nicety, so that you can see which is absolutely the nearest number. As I say, I know very little about your particular department of electric work, and hence am somewhat embarrassed. I would be most glad, however, to answer any questions or cover any points which I may have omitted or which gentlemen may desire to have known. I thank the gentlemen for their courtesy in listening to a matter which is a very old story. (Applause.)

MR. BAILEY: I move that the thanks of this association be tendered to Mr. Garratt for his able discourse on the subject of gauges.

The motion was carried.

MR. LOCKWOOD: It appears to me that there are two points which cover the entire ground of this question. The first of these is that every gentleman ordering wire should know what kind of wire he wants. The corollary of that is that every manufacturer, when he undertakes to fill an order for wire, should know what kind of wire the person that orders it wants. That brings me to the second main feature, which is the necessity whereby telegraphic orders can be sent with few words—concise and clear. It seems, therefore, that the full use of a gauge is that it shall be something which shall express intelligently and intelligibly what kind of wire is wanted, and the size of the conductor, and that we also need to know what material is wanted. It seems, therefore, simply to come to this, that if we can get a series of numbers and letters which shall express unmistakably the kind of wire that is wanted, and if we can get gentlemen to make use of that common code, all that is wanted is done. I find that I cannot altogether agree with Mr. Garratt further. Everybody here in his boyhood learned long measures—that three barleycorns make one inch, twelve inches one foot, etc. I have heard it said that this metric system is a decimal system, and that sooner or later we must come to a decimal system—we must be ready to take the system of the future. It seems to me that while we are thinking of the future we must also live in the present. We have got the inch before us, and there is no more reason why we shall not express fractions of an inch decimally than fractions of a meter. Thousandths of an inch have grown into regular use as the unit for ordering wire by. It is very easy if we want to know the sectional area to square the diameter. I find that we just as frequently want to know the diameter of the wire as the sectional area. If, then, we have the sectional area and want the diameter, we have got to divide or make some other arithmetical calculation which will give us the diameter. Squaring the diameter to get the arc is, I think, easier than to get the diameter from the area. The great point in favor of the thousandth of an inch is that we are all accustomed to it. Another point against the metric system is that if we take the millimeter as a measurement of sectional area or diameters, and do not measure the length of the wire by that system, we are measuring the cross section of the wire by one system and the length by another. If we keep inches and yards and miles for length, I think that we should stick to the same system for sectional area and diameter. At the same time, I would like to add my word of appreciation of this paper. I think it is an invaluable addition to the literature of the electric age. All of it is work that is good work, and we can rely upon the figures.

MR. SARGENT said that he had done some work in connection with the wire gauge for this association, and what made the question very tiresome to him was that after adopting it hardly a single member of the association, he believed, had seen fit to use the gauge. He believed that only himself and one other gentleman in the whole United States were consistent with the declaration of the association and used the gauge. He thought the common sense view of the situation was that it would be a comparatively simple matter for any user of wire to say that he would use one particular gauge of the three well-known and recognized gauges. He did not see that we needed to do away with the ordinary wire gauge and its convenient numbers.

MR. DOOLITTLE: It is now simply a question of convenience in ordering by simple number, whether to use the Birmingham gauge or the Brown & Sharpe, and I recommended the Brown & Sharpe for the reason that it had been adopted by the manufacturers of brass and copper wire, and in ordering wire we simply have to designate the kind of gauge. Of course it is utterly impossible to promulgate any kind of wire gauge and say that it shall be used, particularly in our department, for electric wires are a very small proportion of the total consumption. It is impossible to bring the whole trade of wire to a common gauge, but we can order our wire by thousandths of an inch, and while that would not agree exactly with the numbering, it is near enough so that we can designate it, say a No. 14 or No. 12, or what not, and it will answer the purpose. If I was going to suggest anything I should suggest that the members in ordering wire should designate the gauge.

MR. R. W. POPE, after describing the difficulties growing out of the present mode of ordering wire, said: I propose the following system, that all existing gauges be tabulated in progressive order from the smallest size to the largest in use. This table could embrace every existing gauge. To each size thus specified, design a carefully selected code word of such a character as to be free from liability to telegraphic or caligraphic errors. Such a table would permit a single word to indicate any existing size of wire according to any gauge now in use. As an example of the proposed system, hastily prepared, I submit the following:

No. 20, American, apple.
No. 20, Birmingham, banquet.
No. 20, Standard, salad.
No. 20, Washburn & Moen, wagon.
1,000 circular mills, mammoth.
$\frac{22}{1000}$ of an inch, travel.

A similar code is already in use by manufacturers of iron pipe for the exact specification of sizes and qualities.

Brussels International Exhibition, 1888.

A long list of electrical apparatus and appliances, numbering about a hundred items, has been published, for which prizes or other recognition will be given at this exhibition. On some items, as for instance, accumulators, a statement is made of the points on which judgment will be passed. Those interested in the subject will find a reprint covering several pages in *La Lumiere Electrique* for August 6.

Notes of the Pittsburgh Telephone Convention.

Among the interesting exhibits at the Telephone Convention was that of the Eastern Electrical Manufacturing Company. Secretary Walton Smith and General Supt. Claude E. Gould were in attendance, and explained to their many visitors their switchboards, which present, among other properties, automatic devices for instantly assuring subscribers, by the peculiar manner in which their magneto bell rings, that they have been heard at the central station; also a peculiar device which prevents the possibility of a burn-out by a cross with an electric light wire.

The switchboards presented a neat and business-like appearance, and the mechanical work seemed to be of good quality.

The river excursion given by the Central District and Printing Telegraph Company, on board the commodious steamer Mayflower, was the most enjoyable event of the convention; in fact, the telephone delegates were never treated more handsomely. The entire convention participated, and devoted Tuesday afternoon to unalloyed entertainment. The objective point was the Edgar Thompson Steel Works (Carnegie Bros. & Co., Limited) at Braddock, Pa., where the party disembarked and witnessed the interesting operation of making steel rails. On the return, Vice-President Sargent took the chair, and, on motion of Morris F. Tyler, in a brilliant little speech, a vote of thanks to President Henry Metzger for his superb entertainment was adopted, with three cheers. A fine band of music enlivened the occasion, and an elegant collation, with the best of wines, made happy all the hungry and thirsty. The return to Pittsburgh was made particularly entertaining on account of the brilliant picture the large manufactories of that city presented. At 7 P. M. the boat reached the wharf, and the majority of the delegates left the city on the night trains.

It was remarked that the telephone men discovered the great desirability of platinum plugs immediately on the arrival of Baker, of Newark — remarked as a coincidence merely.

The Okonite, Kerite and Standard Underground wire and cable manufactories were each represented in an interesting exhibit.

The Western Electric Company exhibited a number of cable samples and a new telephone switchboard.

The Electric Boy.

Johnny Norton, who a few years ago was pretty well known all over the country as Bonnell's "Electric Boy," is now working in this city as a compositor. In reply to the query of a reporter as to what had become of his electricity, he said: "That was one of the best 'fakes' of the time, and there was lots of money in it too. When I was on exhibition I was inclosed in an oblong stall, about seven or eight feet long, the front of which was like a narrow counter. Opposite the counter was a rail which only allowed the visitors to pass in single file. A long strip of cocoa matting served as a cover for the passage-way and also as a cover for a sheet of zinc which extended beneath it, running the length of the stall. My box was similarly invested with zinc and matting. Attached to the sheets of metal, but hidden from view, were the two poles of a galvanic battery, one under my feet and the other in the passage-way. Now any one passing over the zinc and touching me behind the counter completed the circuit and received a shock. So did I. The matting, of course, had to be kept damp, water being the conductor. It was surprising what intelligent people were duped by this trick. Why, I was kept shaking hands and being fingered from morning until night. Many's the two-dollar note I received from doctors and others for a couple of drops of my blood for analysis. In fact, my arms were covered with scars made by scientific dupes boring for my electric gore One evening three or four young students came in to unmask me. One of them made a wager that he would electrify the audience the same way if he was in the box. I immediately invited him in, and he accepted the challenge. I then retired, but before doing so I pressed a hidden button that cut off my wire. He, of course, failed, and ignominiously retreated after being guyed unmercifully by those present. This proved me genuine to the satisfaction of every one in that town, and I became famous. There was lots of fun in the business, but I had to give it up, as the constant strain caused by the battery was too much for me."

TELEGRAPHIC

.... All telegraph operators boast of the graduates of their business, and dream of some day being great or rich. Among the men who began by handling the key are Andrew Carnegie; Theodore N. Vail, of the Bell Telephone Company; Gov. Bullock, of Georgia; and ex-Gov. Cornell, of New York; E. H. Johnson, the president of the Edison Company; Thomas Alva Edison; and D. H. Bates, the president of the B. & O. Telegraph. Five of the seven are New Yorkers.

.... Lt. Woodruff, an inspector of the Signal Service, was in Boston recently making an official inspection of the station in this city. He said: "It will be of interest to the public to know that the station on the top of Mount Washington is to be discontinued. It has been interesting to watch the atmospheric changes at that station, but they are of little or no practical benefit to the rest of the district. The altitude is so great that the changes there rarely affect the lower atmospheric strata. The wind might be blowing a hurricane at the summit of the mountain while a dead calm prevailed at the base. I suppose the station will be run in the summer season, say from May to September, inclusive, to accommodate summer visitors to the mountains, but it seems to be a needless expense to maintain it during the winter. It is a most uncomfortable place to spend the winter in, and I guess the operators won't regret leaving it during that part of the year. I suppose this action will surprise a good many people, but really when you come to think of it you will see that the reports from that station are read more as curiosities than as being of any practical benefit." Speaking of the talked of introduction of the electrometer, Lieut. Woodruff said: "We first began to experiment with the electrometer about a year and a half ago, and have made some advancement, but we have not yet brought it to such a state of perfection that we can get any practical results therefrom. We have had electrometers at six stations, and electricians have been experimenting very carefully."

.... The following are the principal parts of the report of the Western Union Telegraph Company for the quarter ending September 30, 1887:

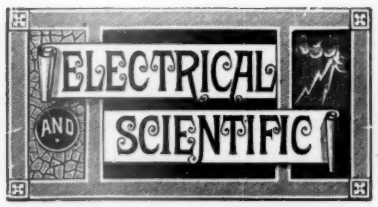
The net revenues of the quarter ending September 30th instant, based upon nearly completed returns for July, partial returns for August, and estimating the business for September, will be about	$1,400,000 00
Add surplus, July 1st.....	7,0.2,185 11
	$8,402 185 11
From which, appropriating for—	
Interest on bonds.....	$122,500 00
Sinking funds.....	20,000 00
	$142.500 00
Leaves a balance of.....	8,259,685 11
It requires for a dividend of 1 per cent. on the capital stock.....	812,000 00
Deducting which leaves a surplus after paying dividend of	$7,447,685 11

In view of the preceding statements, the committee recommend the adoption by the board of the following:

Resolved, That a dividend of 1 per cent. on the capital stock of this company be hereby declared, payable on and after the 15th day of October next to stockholders of record at the close of the transfer books on the 20th of September inst.

Resolved, That for the purpose of the annual meeting of stockholders, to be held on Wednesday, the 12th of October next, and of the dividend hereinbefore declared, the stock books of the company be closed at three o'clock on the afternoon of the 20th of September inst., and be reopened on the morning of the 15th of October next.

Edwin Gould was elected a director of the Western Union Telegraph Company in place of George D. Morgan, who resigned some time ago on account of ill-health, and Sidney Shepherd was elected in place of Henry B. Hyde.



* * The Burlington (Iowa) Telephone Company is doing a good business. Mr. Coffey has proved himself to be a good manager, attentive to the wants of the public, and always courteous and obliging. There has been a gain of about twenty-five new subscribers since he took charge.

* * Application is to be made by the Connecticut River Telegraph Company for a change of its name to the Connecticut Telegraph Company. The company was organized in 1867, and had lines only in the Connecticut Valley region. Since then its plant has been extended, until it has now about 600 miles of wire. It is proposed to extend to Providence, R. I., and to establish stations at Watch Hill, Narragansett Pier, etc.

* * On Friday, Mr. A. V. Kurtz, for some time cashier for the Postal Telegraph Cable Company (United Lines), was appointed manager at Cleveland, in place of Mr. J. H. Simmons, resigned. Previous to entering the employ of this company, some years ago, Mr. Kurtz held a responsible position under the local manager of the Western Union, so he has had the experience to make him thoroughly competent to fill the position to which he has been promoted.

* * We learn that a company has been organized at Milwaukee, Wis., to engage in the manufacture of aluminum by a new process. This process is the invention of a Milwaukee professor of chemistry, A. J. Rogers. It is a secret, but it is understood to be an application of electrolysis. The claim is made that it will enable the production of aluminum at a cost which will enable it to compete with iron. Should this information be confirmed by results, it would indeed revolutionize our metallurgical conditions.

* * It is stated that Mr. Ellis Lever has decided to renew his offer of £500 for a perfectly safe, practical and efficient means of blasting without gunpowder. He has communicated his intention to the Home Secretary, and, on the condition that the Government will undertake the necessary tests and make the awards, he has offered to place in Mr. Matthews' hands £1,000, to be awarded in two premiums of £500 each, one for the best method of safe blasting in coal mines without the use of gunpowder, and the other for a perfectly safe system of electric lighting in mines to supersede the present so-called safety lamps.

* * One more electrician has joined the happy ranks of the benedicts. A neat little note tells of the reformation of Wm. L. Abbott, formerly of the firm of Wunder & Abbott, of Chicago. The brief history of William's reformation is thus told: William L. Abbott, Carrie E. Entwhistle, married, Wednesday, September fourteenth, eighteen hundred and eighty seven, Union Grove, Illinois.

Whereupon the office boy, hat in hand, grinds out his congratulations to the happy pair, thus:

William, Carrie, now you're wedded,
Just one thing I'd like to tell:
Joy depends on social weather—
Always have an *umberell.*

Clouds will shade the brighest sunlight
Whence and whither none may tell;
Social storms are ever harmless,
If Love holds the *umberell.*

So when threat'ning weather rises,
When the angry breezes swell,
Go like racers for the hat rack—
Find and spread that *umberell.*

* * The following is the resolution in full concerning the death of Mr. R. S. Boyd, adopted at the Pittsburgh Telephone Convention as offered by Mr. Tyler: "The National Telephone Exchange Association at its ninth annual convention desires to express its sense of the misfortune which has befallen the telephone fraternity in the death of Mr. R. S. Boyd. Mr. Boyd, by his sweet and genial temper, his hearty good nature, and his refined and attractive manners, endeared himself to us all in the performance of the delicate task in which he put his tact and skill, his industry and unquestioned integrity at the service of his employers. In his death we deplore the loss of an honored and helpful member of this association and of a cherished personal friend, and as a token of the esteem in which his memory is held, the association orders that this minute be spread in full upon its records and printed in its published proceedings." Remarks eulogistic of Mr. Boyd were made by Mr. Tyler, Mr. Metzger, Mr. Eastabrook, Mr. Hovey, and Mr. Storke, after which the resolution was unanimously adopted by a rising vote, and on motion of Mr. Hovey the secretary was instructed to transmit a copy of the resolution to the widow of the deceased.

A Hotel Well Lighted.

Kansas City will soon have one of the finest hotels in the West, if not in the United States. The Grand Avenue, now in course of erection, will be fire-proof from cellar to attic. It is to be a hotel of new ideas. It is being erected by a syndicate which commands all the money necessary, and has that commendable and appreciative sense which sees and adopts what will be of service in an undertaking, regardless of necessary expense. The building will front upon three streets, and every room will be an outside room. Guest calls, annunciators—every electrical appliance is on the list. Three passenger and two freight and baggage elevators are arranged for, and both arc and incandescent lamps will illuminate the structure. The wiring contract was secured by the Western Electric Company, and the job is one of the largest known to the wiremen, and the diagram would make a college telegrapher crazy at sight.

Mr. Willis Howe, formerly of the Palmer House, Chicago, who has ever been a great favorite with the traveling public, has had much to do with the internal arrangement of the hotel, and will assume control on its completion.

A Compliment to a Bostonian.

During the meeting of the National Electric Light Association, in Boston, the members of the Electric Club of that city were very courteous in their treatment of all visitors. This was particularly true in the case of Mr. Geo. W. Adams, who extended hospitalities to the gentlemen named below in a manner ever to be remembered. It became known to them that Mr. Adams was to celebrate the 25th anniversary of his marriage on Saturday of this week, and a very artistic and costly wine set was sent him from New York, accompanied by the following letter:

Mr. Geo. W. Adams, Honored Friend:

We are pleased to hear that you are about to celebrate the twenty-fifth anniversary of your marriage, and wish to offer our congratulations upon the completion of the quarter century of prosperity and happiness which has been yours through the loving care of an all-wise Providence.

To your wife we also tender our congratulations for her devoted ministrations to your happiness, and for the furthering of the name so aptly applied by your friends, "Happy Adams," a name which tells the story of your congenial nature in a word.

We send herewith a small token of our esteem, and trust that, as you grasp the cup that cheers, your thoughts may occasionally turn to yours fraternally, Cyrus O. Baker, jr., Geo. T. Manson, Fred. W. Royce, John F. Noonan, Henry D. Stanley, E. F. Peck, Willard L. Candee, Frank Ridlon.

—— The Gilliland Electric Company, Adrian, Mich., has been organized with a capital stock of $50,000. Robert Gilliland and others, incorporators.

—— The Catskill Electric Light Company, Catskill, N. Y., has been incorporated. Capital stock, $20,000. Manly B. Mattice and others, incorporators.

—— The Bessemer Electric Light and Power Company, Bessemer, Ala., has been incorporated. Capital stock, $50,000. E. A. Burke and others, incorporators.

The Westinghouse and Thomson-Houston Electric Companies Combine.

The public announcement is made of what has been known to a few for several months past, that an agreement has been made between the officials of the Westinghouse Electric Company and the Thomson-Houston Electric Company. The terms, as far as made public, are as follows:

The Thomson-Houston Company recognizes the validity of the Gaulard-Gibbs patent, owned by the Westinghouse Electric Company, and has taken a perpetual license under it for the New England States. Hereafter the Thomson-Houston Company are to enjoy the right to manufacture and supply the alternating current apparatus in the New England States, and also for some 200 local companies which it has already established outside those limits; this will give that company a large amount of additional business in incandescent lighting wherever its arc lighting plants are now in operation.

The Westinghouse Company, on the other hand, acquires the right to supply the electric lighting apparatus and introduce and sell the arc light plants of the Thomson-Houston Company on favorable terms all over the United States, and at the same time secures from its competitor the recognition of all its alternating current patents, as well as the payment of substantial royalties thereunder.

The Westinghouse alternating current system, although on sale for less than a year, already has in operation over 100,000 central station incandescent lights, and under the influence of this combination it may safely be predicted that the growth of the system will be even more rapid in the future.

The factories of the two companies, one at Pittsburgh, the other at Lynn, are models of their kind, and are collectively of enormous capacity. They will be able to turn out all the apparatus required for 5,000 or 6,000 lights per day. No such important combination of electric lighting interests has heretofore been made, either in America or Europe; and thus these two companies are placed in an unexcelled position with reference to the electric lighting business of the country.

Wound Up in Electric Wires.

At Lincoln, Neb., a workingman named Smith was mutilated in a remarkable manner last week. On O street, at the corner of Ninth, hanging from a telegraph pole, and lying along the ground for a distance, was a broken telephone wire, which had, in some manner, become crossed or in connection with one of the electric light wires. As Smith was passing along the street, he saw the wire burning, and, attracted by the strange appearance, and not realizing what it was, evidently took hold of it to ascertain what it meant. The shock he received was terrific, and his shrieks brought hundreds to the street. He could not loosen his hold on the wire, and it burned his hands to the bone. In his writhings and contortions the charged wire came in contact with his head, burning out one of his eyes, and laying the side of his face open. Wherever it struck his body, it cut like a knife. A bystander, realizing the peril of the man, ran to him, grabbing him to pull him from the wire; but by the shock he received, when he came in contact with the body of the man, he was knocked ten feet into the street, and utterly prostrated, so that it was feared he was also killed. By this time the electricity had either burned the man Smith loose from the wire, or he had succeeded in his struggles in breaking away. He was picked up, and carried into an adjoining restaurant, and a half dozen physicians summoned. The man presented a horrible appearance, and, despite the physicians' efforts to put him under the influence of morphine, he shrieked and writhed in the agony he suffered, until taken to the hospital. The doctors express the opinion that he may survive his injuries, although it appears impossible.

.... The Toulmin electric railway gate is an automatic gate that the inventor thinks will replace the present hand gates at railroad crossings.

A Dinner in Pittsburgh.

It was not altogether dry work over at the Pittsburgh Convention last week; not that we would imply that things were particularly moist or even wet, but just damp enough, and, to still further explain, not altogether dry in the sense of being interesting, but here we fear being understood to imply that it was partly uninteresting, which is far from being the truth, and as this is getting very complicated, we wish simply to say that a few congenial souls sat down to a most wonderful dinner, in the City of Natural Gas and cussed—no, we mean wonderful improvements and other things.

There was Hon. C. O. Baker, jr., who sat at one end of the table and platinized the whole company in the way we all know to be so peculiarly his own with a string of anecdotes which would have done justice to a Denver stage driver. Driven to a state of frenzy, Mr. H. D. Stanley rose to his feet—his hair closing down like an iron shutter as he did so—and delivered himself of the first and only speech which the writer ever remembers that he has been guilty of, and here let it be recorded that it was a rousing good speech too, full of pith and wit. Over at the northwest corner of the table sat with modest mien and childlike simplicity, Mr. R. F. Ross, shedding a soft but strong modern light over the generous board, ablaze with glistening crystal and snowy linen and groaning under its load of viands. Opposite him sat Mr. Morris Meade, who rang a metaphorical fire alarm whenever the demands of the case required it, this being especially the case whenever Mr. George T. Manson showed symptoms of making a speech. At the other end of the table sat Mr. S. A. Duncan, the mainspring of the occasion, who, with thoughtful care, guided the elegant repast from the soup to the black coffee. About the middle of the evening, Mr. A. V. Garratt, who had been unavoidably delayed, came in and applied the metric wire gauge to a few of the courses and a number of excelled brands of old choice wines.

And who was the host? What matters that, so long as each man felt his neighbor to be his guest. Many were the healths that were drank, and as the glasses touched they rang to the note of true friendship.

Waggish Electricians.

AMUSING EPISODES IN CONNECTION WITH THE CONVENTION OF WIRE WORKERS.

The delegates to the telephonic convention here have nearly all gone home, and the boys all had a good time. There were quite a number of wags in the party, and among them was Mr. C. O. Baker, jr., who registered at the Monongahela House as being from New York, but who in reality hails from the red mud region near New Jersey. Last evening Dr. Garratt, on going to the train, found that his overcoat was mysteriously missing, and made quite a hunt for it. The next discovery made was that a valise belonging to Harry D. Stanley, of Bridgeport, Conn., had disappeared. Upon making an investigation they discovered that the irrepressible Baker had packed the overcoat belong to Garratt in Stanley's grip-sack and shipped it to Bridgeport. There were quite a number of other little episodes which created a good deal of amusement.—*Pittsburgh Post.*

—— The Western Engineering Company has been organized at Lincoln, Neb., and purposes engaging in all electrical engineering work, particularly the installing of electric and steam plants. Mr. J. G. White is general manager of the company.

—— The Portsmouth Gas Company, of Portsmouth, Va., has just ordered two ten-inch double electric belts of Chas. A. Schieren & Co., New York. The electric belt is popular with gas people as well as electric light companies.

A Short History of One of Prof. Moses G. Farmer's Dynamo Electric Machines.

To the Editor of Electrical Review:

The machine was built in the latter part of the year 1878, and experimented with at No. 15 Congress street, Boston. About 175 pounds of No. 16 copper wire were used on the field coils and armature, the whole machine weighing 900 pounds. There was no steam power in the building, and so a large cast-iron wheel, with belt to machine, turned by two men, was used. The arc light was with carbons, adjusted by hand.

It being a great curiosity many came in to see it, and among them Mr. Frost, chief engineer of the Hoosac Tunnel. He was so well pleased that he wanted to have the whole thing sent up there to try the light at the heading. Mr. Frost said he had men enough to turn it. Mr. Farmer sent his assistant up to the tunnel to see if there was any way to utilize the compressed air that they were using in driving the Burleigh drills. He went and reported favorably. An electric lamp was made and the machine and lamp were taken to Mr. Thomas Leavitt's machine shop, where it was run successfully by steam. It was never taken to the tunnel for this strange reason, that there were not enough carbons in Boston to supply this one lamp a single month. All carbons were imported then.

The machine and lamp was exhibited at the Mechanics' Fair, in Quincy Hall, in the fall of 1874, together with two torpedo machines, and a silver medal was awarded Mr. Farmer. A reflector was used with the lamp, and the light was so intense that shadows of the gas flames were cast, the gas jets being more than 150 feet from the electric light.

This is believed to be the first electric arc lamp exhibited in this country, where the electricity used was generated by a dynamo machine. In the year 1851, at New York at the Crystal Palace, an electric light was exhibited, but the current was from a magneto machine.

As soon as the fair closed, the machine was taken to the Inst. Technology, and a series of experiments made with it by the professors.

It remained there until June, 1875, when Mr. Charles Stowell took it to Philadelphia to the Centennial grounds, near to the then unfinished Art Gallery. This was done at the suggestion of Prof. Geo. F. Barker, who had charge of the experiments, and who also had his own Gramme machine mounted upon a wagon (with portable engine to drive it), drawn to George's Hill. The Farmer machine furnished a light on the dome of the Art Gallery. Both lights were used on the evening of the 5th of July, 1875 (the 4th fell on the Sabbath).

The committee of the Centennial Exhibition were present, and desired to try still farther, so the lights were lit again on the 6th. This time the Farmer machine lit the lamp on the top of a hastily constructed wooden tower, near the main entrance to the grounds, and Prof. Barker's was used all over the grounds, being drawn from place to place, as the committee desired.

The Farmer machine is still in existence, but has not been used. A few years ago it was proposed to place it among other electrical devices in Franklin Institute.

CHARLES STOWELL.

P. S.—I would much like to know if any of the readers of the REVIEW know of any earlier dynamo-machine. Mr. Farmer told me he was pretty sure it was the first.

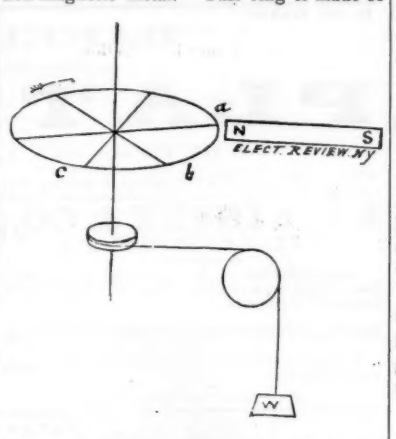
C. S.

** A resident of Plymouth protects his grapevines from fruit thieves in a novel manner. The supports are of wood, but the crosspieces are of wires, insulated from the ground, and connected with an induction coil capable of delivering a heavy spark through an inch of air. The other pole of the coil is connected to the ground. Six good-sized bichromate of potash cells furnish electromotive force for the coil. Short wires hanging among the vines are secured to the large wires, and when any one monkeys with the grapevine while the battery is connected, the neighborhood is apt to hear from him. It works every time, and no one comes for a second dose.

A Novel Magnetic Engine.

The following, from *Science*, March 7, 1884, will be of interest at the present time: It is a well-known fact that iron, when heated to a red heat, ceases to be magnetic; so that an armature, after being heated to redness, may be removed from its magnet by the expenditure of only a small fraction of the energy which is developed by the attraction of the same armature when it has cooled.

Manifestly, this fact might be employed in the construction of a motor which, while of no practical value, is of theoretical interest, in which a permanent magnet should act as the direct motive force. This has been done in the following manner: In the figure *a b c* represent a ring thirteen centimeters in diameter and supported horizontally upon radial arms and an axis of some non-magnetic metal. This ring is made of



one or more turns of iron wire of about a millimeter diameter. *N S* is either a permanent or an electro-magnet. The axis is furnished with a driving pulley, cord and weight, as shown in the figure.

That part of the ring which lies between *a* and *c* is heated to bright redness by means of two or three Bunsen burners. The magnet then exerted a preponderating attraction upon the farther or cool side of the ring, and the latter revolves as indicated by the arrow. As fast as the ring enters the space *a b c* it becomes red hot and non-magnetic, and a lack of equilibrium is thus maintained, which results in a continuous rotation.

The motion is necessarily quite slow, on account of the considerable time required to heat the iron ring. In the actual experiment, moreover, considerable difficulty was experienced from the distortion which the ring underwent when softened by the heat, in consequence of which the speed of rotation became very irregular. With a permanent steel magnet a speed of about one revolution in two minutes was obtained; and with a powerful electro-magnet a weight of six grammes was raised fifty centimeters in six minutes, and in a second experiment (the ring having become quite distorted) ninety centimeters in thirty minutes.

Of course the source of energy is the Bunsen burners; and the experiment leads at once to the fact that the specific heat of magnetized iron is greater than that of unmagnetized. CHAS. K. MCGEE.

University of Michigan,
Ann Arbor, Feb. 19, 1884.

A Test Case at Pittsburgh.

The suit of the Mechanics Bank against the Allegheny Light Company for a debt of $5, on account of the erection of a pole by the Light Company on the bank's property on Fourth avenue, was heard before Alderman Cassiday, and the alderman gave judgment for the plaintiff, and Mr. W. B. Rodgers, appearing for the electric light company, gave notice that he would apply for a writ of certiorari to settle the matter in court. This suit is regarded as a test case, and the final result is therefore of considerable importance. The watchman of the bank chopped down the pole in the night, on the ground that the electric light company was trespassing upon the bank's property. The decision of the alderman supports the bank's position. Mr. Rodgers requested the alderman to make the damages $5 34, so that he could appeal to court without delay, but the alderman refused. It will be taken up on a certiorari.

—— The Thomson-Houston Company are reported to have 3,500 arc lights burning nightly in Canada.

—— Bids for furnishing the city of Des Moines, Iowa, with 100 arc lights have been opened and referred.

—— The Kansas City Electric Light Company is very busy placing arc lights in position for the exposition and parade in that city.

—— The proprietors of the new building for amusement puposes to be erected on the site of the old Madison Square Garden have contracted for 4,850 Edison lamps.

Electric Light in Wisconsin.

Advertising in La Crosse, Wisconsin, is making lots of fun. The Edison electric light station there has been doing a thriving business, and putting in light so extensively that the gas company got considerably worried. The gas company took the Brush system into its embrace, and dazzled the eyes of the newspaper reader with an announcement that it is now prepared to furnish gas, arc or incandescent electric light, and is evidently very much in earnest too. The citizen of La Crosse has only to say, "Let there be light," and life will be a burden to him at once and onward, until a contract is signed with one party or the other.

In Oshkosh, too, they are having fun with the boys. The Thomson-Houston folks are making the dancing floor warm for the gas people, and they are waltzing round in fine style.

Telephoners Visit the Westinghouse Factory.

Among the many pleasant things connected with the Telephone Convention was the kind invitation from the Westinghouse Electric Company to visit in a body and inspect their factory. This invitation was largely responded to, and, at the appointed hour, a long procession of carriages filled with telephone men left the Monongahela House for an afternoon's visit to one of the largest and best equipped electric light factories in the world.

They were greeted at the door by a cordial word and hearty grasp of the hand from Mr. Westinghouse, and the party began its tour of inspection under the guidance of Mr. H. M. Byllesby, aided by a number of gentlemen connected with the establishment, conspicuous among whom, in his eagerness to show a true hospitality to the guests, was Mr. Albert L. Reinmann, who took special pleasure in explaining to his interested audience the intricacies of the manufacture of the incandescent lamp, one of the chief features of which was the beautiful working of a gang of one hundred and thirty automatic vacuum pumps capable of exhausting at one time as large, if not a larger, number of lamps than any other set of pumps in this country, or, perhaps, even in the world.

One of the striking peculiarities of the whole visit was the openness with which the visitors were allowed to inspect every portion of the immense factory, there apparently being very few, if any, closed doors.

The representative of the ELECTRICAL REVIEW, in an interview with Mr. H. M. Byllesby was informed that the factory now employed about eight hundred hands, and that the addition, which is now well under way, will about double the output of the factory and the number of employes.

The development of the business has been almost phenomenal, and there are now in this country sixty-two central stations, of which thirty-two are completed and in running order; and to illustrate the success with which they are working, it may be noted that twelve stations have already been increased in capacity.

The total number of lamps running by this system is 125,000. Among the large stations may be mentioned the following: Denver, Col., 6,500 lights; Minneapolis, 6,500 lights; New Orleans, 6,500 lights; Trenton, N. J., 5,200 lights; Allegheny City, 10,000 lights; South Side Pittsburgh, 3,000 lights; Pittsburgh, 10,200 lights.

ELECTRIC LIGHT NEWS

—— The Schenectady Locomotive Works have ordered 500 Edison lamps to be installed at once.

—— The new electric car for the West-End Railway, Boston, is both lighted and propelled by electricity.

—— The Jersey City Electric Light Company has been granted a franchise. The price is 40 cents a lamp per night.

—— There is a good opportunity to secure an arc light contract at St. Albans, Vt. The city wants to be lighted by electricity.

—— The City of Pekin is to be lighted with 200 Edison lamps, the work being done in San Francisco, and contracted for in New York.

—— The Citizens' Gas Light Company, Jackson, Tenn., has decided to put in an electric light plant of 50 lights, with steam power for 100 lights.

—— The Cannon Manufacturing Company, Concord, N. C., intend building a 4,000 spindle cotton mill to be lighted by the Brush incandescent light.

—— The Minister of War in Russia has offered a prize of 500 roubles for the best primary battery, to be compact, practicable, and adapted to incandescent lighting.

—— It is stated that a 32 candle Edison lamp in the offices of the *Toronto Globe* has given light, five hours per day, since November, 1884, *i. e.*, a total of over 5,400 lamp hours. Next!

—— The electric light in Newark, N. J., is reported by indignant citizens to be killing the trees. It is hard to say just what electricity might do in New Jersey. It has to get even with the beverage known as "Jersey lightning" in some manner.

—— The electrical laboratory, now being built at West Orange, N. J., by Thomas A. Edison, will cost about $60,000, and will be the largest of the kind in the country. The main building is 53x255 feet, and there will be three smaller buildings, each 25x100 feet.

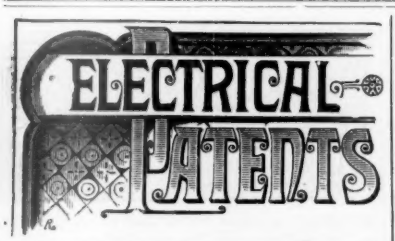
—— According to the May report of the Edison Company, the total number of lamps installed had reached the following figures:

891 Isolated plants	in U. S.,	230,674	lamps.
102 Central station	" "	290,300	"
13 Municipal "	" "	6,500	"
	Total,	527,474	

—— The Boston News Bureau says: The report that the Bell Telephone Company is bringing suit against Turnbull, for the purpose of opposing the interests of the Chinese telephone syndicate, is denied by Bell officials here. The company has no interest whatever in China, where the telephone is free to everyone to use. The suit between Turnbull and the Bell Company is a common case of alleged infringement.

—— Another electric light ordinance has been passed by the city council of Winfield, Kas. This one is passed and placed in good hands, and the construction of a good electric light plant is now a certainty. The ordinance, too, has something to do with the work; and this one is much more liberal than any previous ones, and is still better for both the city and the constructors of the light. Col. Hartzell is the general manager of the company.

—— The news comes from Sumter, S. C., that the town council has signed the contract with the Maryland Electric Motor Manufacturing Company for the erection of electric lights in that city, to be maintained for a term of five years at a cost of $2,700 per annum to the town. The same instrument grants a franchise for an electric railway for the same term of years. The erection of the plant will be commenced immediately, and it will be in operation probably in three months.



INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPT. 27, 1887.

370,423 Electric lamp; 370,424, Electric lamp; Joseph J. Skinner, Boston, Mass.

370,434 System of electrical distribution; Ferdinand A. Wessel, Brooklyn, N. Y.

370,439 Electric burglar alarm; James B. Yeakle and Arthur Steuart, Baltimore, Md.

370,477 Telephone; Hammond V. Hayes, Cambridge, Mass.

370,528 Electric cable; Francois Borel, Cortaillod, Switzerland, assignor to the Societe d'Exploitation des Cables Electriques Systeme Berthoud, Borel et Cie.

370,572 Electric arc lamp; 370,573, Regulating device for alternate current circuits; Elihu Thomson, Lynn, Mass.

370,575 Electric speed regulator for revolving motors; 370,576, Repeater for harmonic telegraphs; 370,577, Phono-multiple telegraphy; Francois Van Rysselberghe, Brussels, Belgium.

370,605 Coupling for electro-pneumatic brake systems; J. Fairfield Carpenter, Berlin, Germany.

370,691 Printing telegraph; Stephen D. Field, New York, N. Y., assignor to the Commercial Telegram Company, same place.

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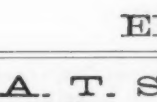

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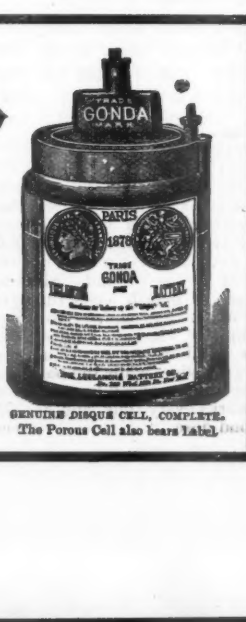

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